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ROBERT S. PEABODY FOUNDATION
FOR ARCHAEOLOGY

FIRST ANNUAL REPORT OF THE TEHUACAN ARCHAEOLOGICAL-BOTANICAL PROJECT

BY

RICHARD STOCKTON MACNEISH

A project supported by grants in aid from:
THE NATIONAL SCIENCE FOUNDATION
THE ROCKEFELLER FOUNDATION

PHILLIPS ACADEMY ANDOVER, MASSACHUSETTS
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1961

PUBLICATIONS OF THE
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BULLETINS

I. Exploration of Jacobs Cavern, McDonald County, Missouri. By Charles Peabody and W. K. Moorehead. 1904. (out of print)

II. The So-Called "Gorgets." By Charles Peabody and W. K. Moorehead. 1906. (out of print)

III. A Narrative of Explorations of New Mexico, Arizona, Indiana, etc., together with a Brief History of the Department. By Warren K. Moorehead. 1906. (out of print)

IV. Part 1. The Exploration of Bushey Cavern near Caveton, Maryland. By Charles Peabody. 1908. (out of print)
Part 2. Fort Ancient, the Great Prehistoric Earthwork of Warren County, Ohio. By Warren K. Moorehead. 1908. (out of print)

V. Certain Peculiar Earthworks near Andover, Massachusetts. By Warren K. Moorehead. 1912. (out of print)

VI. Hematite Implements of the United States, together with Chemical Analysis of Various Hematites. By Warren K. Moorehead. 1912. (out of print)

TEHUACAN ARCHAEOLOGICAL-BOTANICAL PROJECT, REPORTS

NUMBER ONE

Botanical Project. Richard Stockton MacNeish. Robert S. Peabody Foundation for Archaeology, Andover, 1961. vi + 32 pp., 15 figs. $1.00.

A number of widely held assumptions are stated on the first page of the report. Among these, by direct quotation or close paraphrase, are: (1) Here (in Mexico and Central America) was a civilization that arose completely independently of those in the Old World. (2) Any hypothesis concerning the origin of urban life could be tested in this (Mesoamerican and Central American) aboriginal experiment in civilization in the New World. Reconnaissance in southern Oaxaca, the Tehuacán Valley (Puebla), and the Río Balsas region led to selection of the Tehuacán Valley through discovery of primitive corn in a stratified cave that could be dated at about 3600 B.C.

The Tehuacán project was set up to look for the continuum from "primitive hunter to sophisticated urban dwellers," to look for evidence of the first villages in the New World, and to learn about the origin of pottery and maize domestication in the New World. The program to date has been supported by the Rockefeller Foundation and the National Science Foundation through the Robert S. Peabody Foundation, Andover. This first report deals primarily with findings to date in two stratified sites, Coxcatlán Cave and El Riego Cave. Pumpkins appear not earlier than 3000 B.C. in Puebla and squash perhaps as early as 6000 B.C. These dates are of interest because pumpkins were domesticated between 6000 to 7000 B.C. in Tamaulipas and squash about 2000 B.C. Gourds appear by 6000 B.C. in Tamaulipas and by 4000 B.C. in Puebla. Multiple origins and slow diffusions are implied.

Coxcatlán Cave shows a series of six stratified cultural complexes, the earliest of which is named Ajuereado, dating from 8000 to 7000 B.C., and is characterized by Lerma and Midland points and stone implements indicative of a hunting and plant collecting economy. El Riego Cave was occupied about 2000 B.C. and repeats the upper series of cultural complexes in Coxcatlán Cave. The caves contain quantities of perishable materials such as wood, basketry, cotton textiles, bark cloth, as well as pottery and stone implements. In the Coxcatlán preceramic culture complex, tentatively dated 5000 to 2000 B.C., stone vessels (not mortars) occur in three forms "identical to the earliest preceramic [*sic,* read *ceramic*] forms of Mesoamerica." The author asks, "Is it not possible that pottery in Mesoamerica arose from first supplementing stone bowls with clay, then actually duplicating the forms of stone bowls totally in clay?" It is surely possible, but also possible is that the stone bowls in the Coxcatlán complex are imitations of ceramic forms. I make this observation with the recollection that Earl Morris thought he could see the beginnings of pottery making in the San Juan area, but failed to appreciate the true significance of the few redware sherds and vessels (Anthropological Papers of the American Museum of Natural History, Vol. 28, Pt. 2, p. 186, 1927). Stimulus diffusion or some such process would necessarily have to be weighed as an alternative to the idea of the origin of Mesoamerican pottery in Puebla.

The beginning of the Tehuacán project is auspicious; the sites are deep, stratified, and from them we shall no doubt learn some much needed facts about Early Formative, both substantively and as to its antecedents.

Robert F. Heizer
University of California
Berkeley, Calif.

From AMERICAN ANTIQUITY,
Vol. 28, No. 1, July 1962, p. 119.

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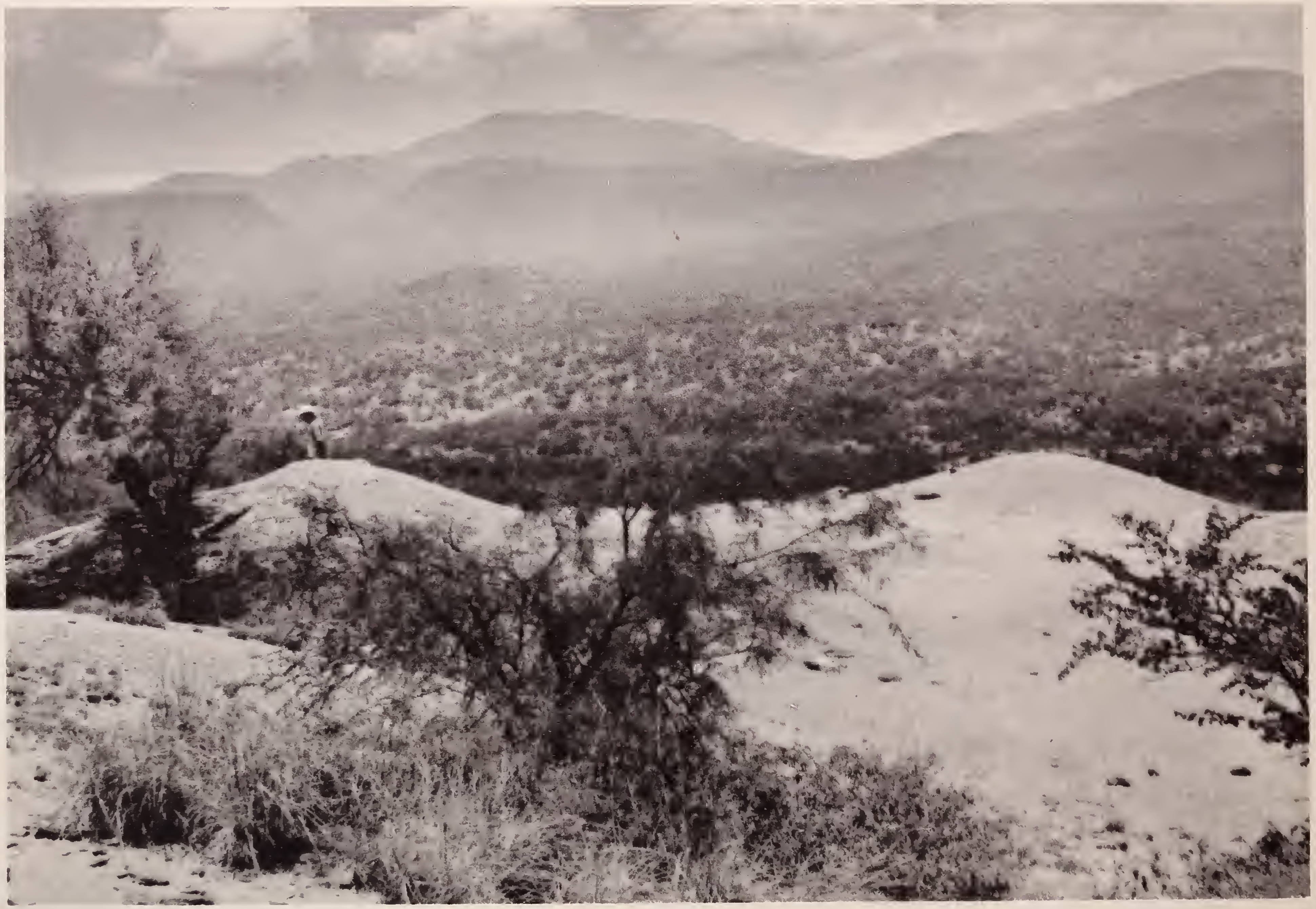

Tehuacan Valley. View of mounds overlooking the Calapilla River.

hillips Academy. ROBERT S. PEABODY FOUNDATION
FOR ARCHAEOLOGY

Report of the Tehuacan ...

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ANNUAL REPORT

A problem that has long interested the scientist, the philosopher and the layman is how and why civilization arose. The ancient high cultures of Mexico and Central America have always represented an interesting facet of this problem for here was a civilization that arose completely independently of those in the Old World. Any hypothesis concerning the origin of urban life could be tested in this aboriginal experiment in civilization in the New World. Although an intensive search for a long sequence from primitive hunter to sophisticated urban dwellers has been made in Mexico for over a hundred years by many investigators, it had not been discovered. The Tehuacan project hoped to find such a sequence.

Intimately involved with this general problem were more specific problems connected with the crucial transitional stage from savagery to civilization. How, when, and where did plants first become domesticated and what was their effect on cultural change? In fact, there was no knowledge about the manner in which maize, the staff of life of the New World, was first domesticated, or the time and place where this occurred. The aim of the Tehuacan project was the discovery of this information. It was also hoped that the Tehuacan project could shed light on the origin of the first villages in the New World, and on the origin of pottery, the supposed "index fossil" for first villages. Thus, the Tehuacan expedition had worthy purposes and our hopes and dreams were on an exalted level. To paraphrase an Old World colleague, we hoped to throw light on the rise of civilization of the ancient west.

Experience had taught us that basic to the rise of civilization was the development of agriculture. We assumed that if we could find the origin of agriculture, and in the case of the New World this meant cultivation of maize, then we would be well on the way to finding out where, when and how civilization itself arose.

Thus, our first problem was to find the area where maize was first domesticated. Fortunately, previous studies greatly helped us. Before 1948 most information came from botanists who had studied modern corn. It had been determined that corn had been developed in the New World. Most of its primitive characteristics were known, and it was believed that it probably came from a highland grass. Archaeological studies in the Viru Valley suggested that corn originated to the north of that area. Characteristics of corn cobs found in caves in the southwestern United States suggested that corn originated to the south of that area. Starting in 1948, archaeologists, working in conjunction with botanists began rapidly to delimit the area of the search. Finds of archaeological corn in several places, including northwestern and northeastern Mexico, and Bat Cave, New Mexico, showed that corn had been domesticated for at least 5,000 years somewhere to the south of that general region. Furthermore, studies of fossil pollen in the Valley of Mexico gave evidence that the first

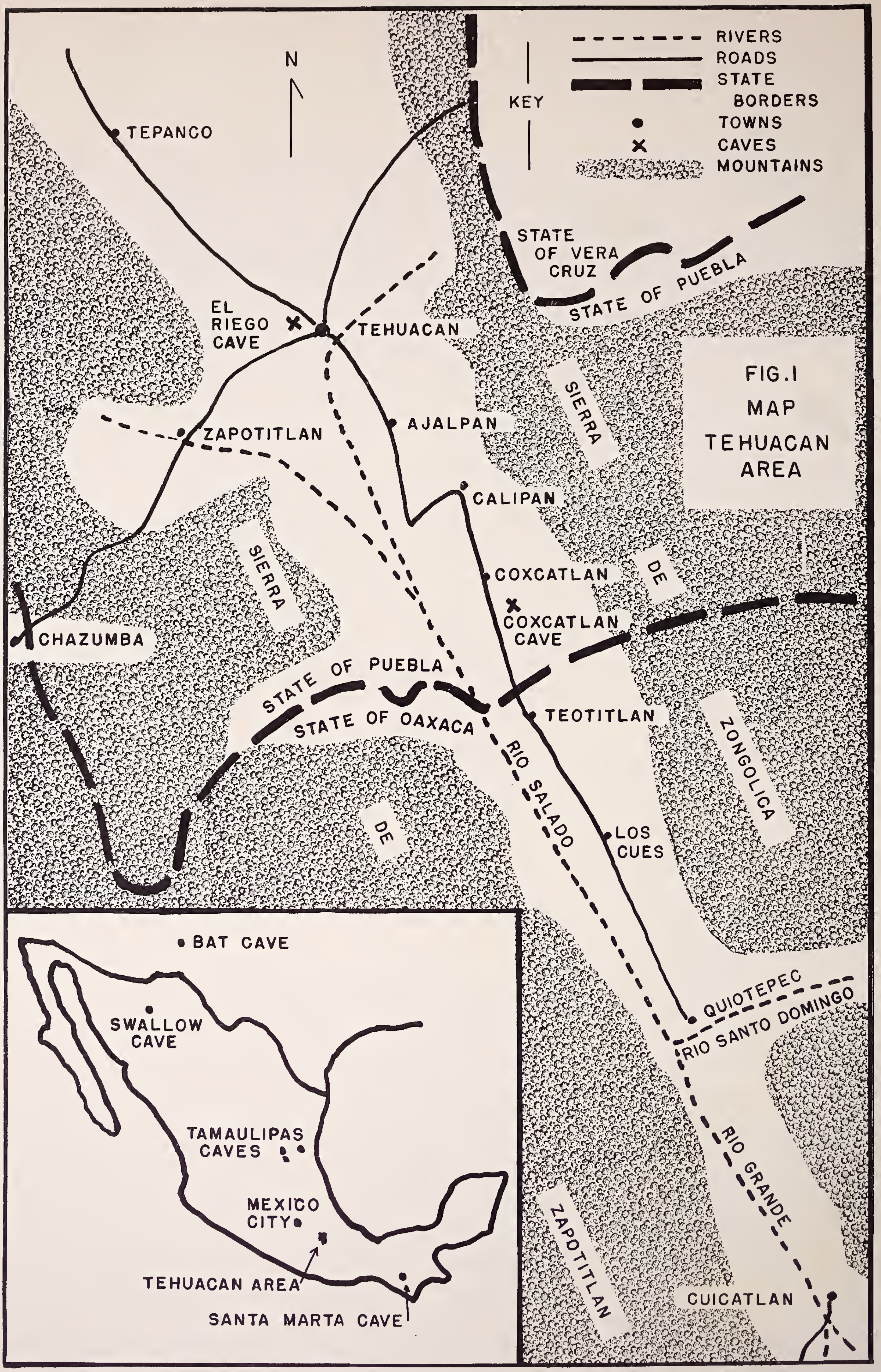


FIG. I
MAP
TEHUACAN
AREA

domesticated corn there was of approximately the same age. It therefore appeared likely that the origin of corn was to be found still farther south. In 1959, excavations and pollen studies in Santa Marta Cave, in Chiapas, indicated that the antiquity of corn there was not great enough to justify consideration of the region as its homeland. Probably the origin of maize was to be found north of the Mayan country. (See Fig. 1, insert map).

At this juncture, I conferred with Dr. Paul C. Mangelsdorf, Director of the Botanical Museum of Harvard University. We did some stocktaking and discerned a number of facts which further defined the area of search. Previous archaeological finds indicated that the search should be between the Valley of Mexico and Chiapas. Botanical evidence showed that corn was a highland grass and therefore only the highlands were pertinent. Finally, specimens susceptible to study were to be found mainly in dry caves in a dry region. We recognized that caves often had one floor on top of another and remains from such a succession of floors might show the evolution from wild corn to domesticated maize. Ergo, one must look for a highland region having caves suitable for occupation, a dry climate for the preservation of corn cobs, located between southern and central Mexico.

A careful study of rainfall, climatic, topographic and geographic maps revealed only three likely regions: southern Oaxaca, the Tehuacan Valley, and the Rio Balsas area. Here one might find the original home of corn. Archaeological dates from previous work indicated it should be older than 5,000 years ago and botanical studies indicated that it should be like the most primitive cobs found at Bat Cave, New Mexico. In the winter of 1960 a brief survey of southern Oaxaca was made and few suitable caves found. Then in the Tehuacan region, on the 27th of February, 1960, a test in a stratified cave revealed tiny, very primitive corn cobs in a layer which could be dated about 3600 B.C. At last it seemed we had the correct region in which to concentrate our investigations.

With archaeological problems defined, and the area for field research geographically delimited, the next problem revolved about the kind of organization which could most successfully sponsor a program of this sort. Should it be a huge institution with many facilities and a large staff, or a small, flexible institution with experience in such matters, and the ability to call upon a wide variety of specialists from many institutions? The latter was perhaps the better choice, and the Robert S. Peabody Foundation for Archaeology the ideal institution. It had a long history of sponsorship of well-defined programs, such as the Southwestern Expedition which studied the ruined pueblo of Pecos; the Andover-Harvard Yukon Expedition, and others. Furthermore, it had shown an interest and a capability of handling interdisciplinary programs, such as the study of the Boylston Street Fishweir, and the study of Grassy Island. Its record of publication of results of such endeavors was well known. Also, its staff, headed by Douglas S. Byers and Frederick Johnson, had the ability to administer an endeavor of this sort. Follow-

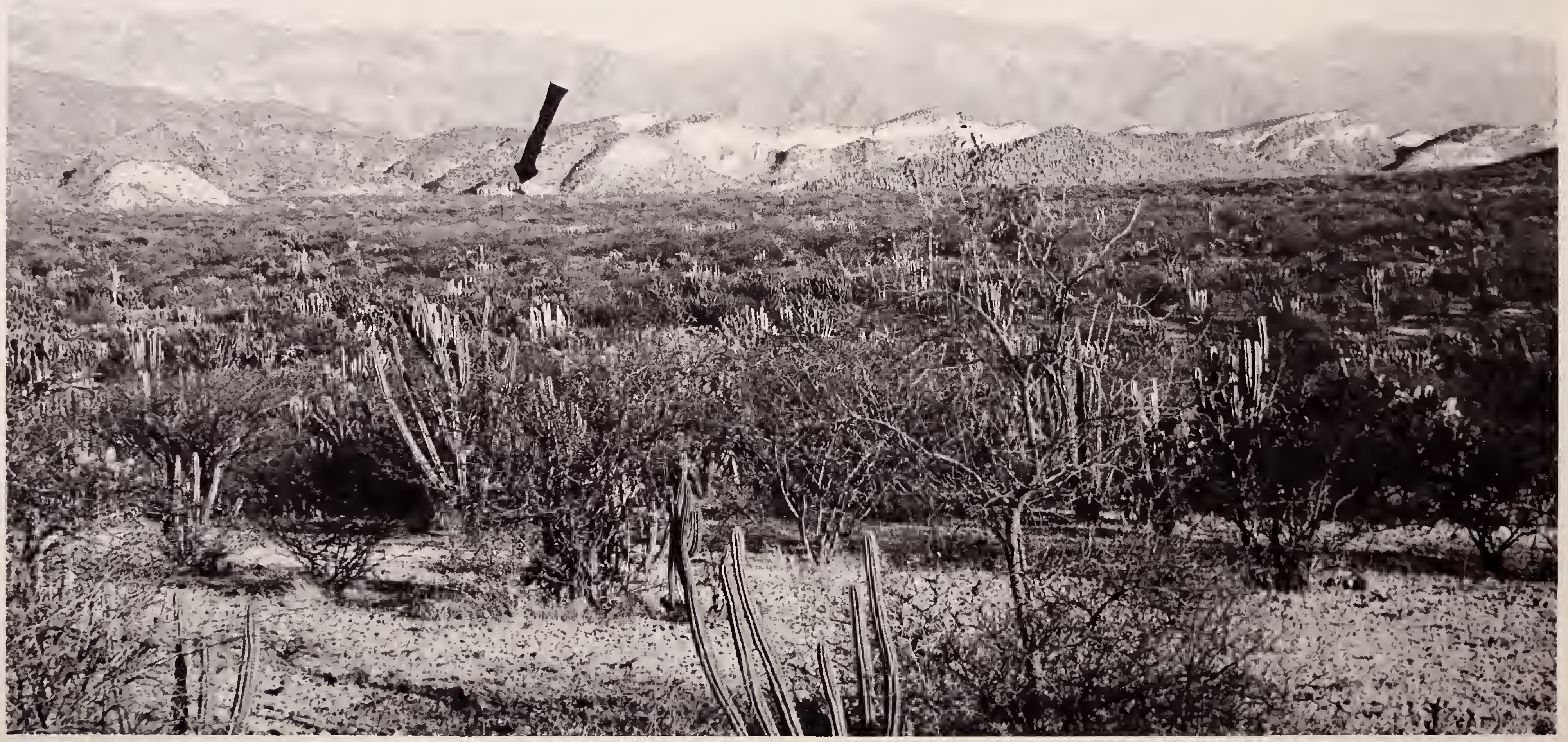


Fig. 2. Tehuacan Valley. View eastward toward the Sierra de Zongolica. Coxcatlan Cave is located by arrow.

ing discussions with them, in the spring of 1960, we agreed to set about making plans for financing the expedition. I was appointed Research Associate of the R. S. Peabody Foundation.

The Foundation was most fortunate in obtaining funds for the initial part of the investigation from the National Science Foundation and the Rockefeller Foundation, Agriculture Section. We are grateful to the members and associates of the National Science Foundation, and the Agricultural Research Section of the Rockefeller Foundation, who have contributed so greatly to the success of the project. The Peabody Foundation and the field office organized a simple but practical method of accounting for the receipt and expenditure of subventions. As field director I can testify to the rapid and efficient organization of this system.

In terms of organization of the project, there were three divisions. At the top was what might be called the home office or sponsoring institution, under the direction of Douglas S. Byers. This office requested, received and dispersed funds and did the basic administration and planning.

The second echelon was the field group. I was its Director. During the first season from January 6 to June 1, 1961 I was in the field in the Tehuacan region, having obtained leave without pay from my position as Chief of the Archaeology Section of the National Museum of Canada. It is fitting to thank Dr. L. S. Russell, Director of the National Museum of Canada, E. A. Cote, Assistant Deputy Minister of the Department of Northern Affairs and National Resources, and the Canadian Civil Service Commission for allowing this leave.

My duties in the field were diverse. There was, of course, the administration, the supervision of field research, the training of personnel and liaison with technical consultants, local scientists, visitors, and contributors. My most vivid recollections involve functioning as instigator of specific projects. In January and February I worked with Dr. Frederick A. Peterson doing survey; when the reconnaissance began to run smoothly, he took total charge of it. Next, excavation in Coxcatlan Cave was initiated by me; in April, at about the time that the 'dig' began to become successful and very interesting, its direction was completely turned over to Dr. Melvin L. Fowler. In the latter part of April, I started the El Riego Cave excavation; by May it had been left in the capable hands of Angel Garcia Cook. During May I organized the laboratory and by the end of the month and just before my departure, Miss Toni Nelken was running it very well. Undoubtedly my duties will change in future seasons as initiating projects will be less necessary and I will probably be doing more laboratory analysis--this, of course, keeps me in the closest possible touch with the actual excavations--and cooperating with visiting technical consultants. Of course, I hope that occasionally I may be able to sneak off and enjoy directing an excavation.

In the field, Dr. Frederick A. Peterson was Assistant Director. He has had long experience in Mexican archaeology and was formerly Director of the New World Archaeological Foundation in Chiapas. He remains in the Tehuacan area the full year around. His duties are two-fold. On the one hand, he directs the archaeological reconnaissance in the Tehuacan region. He is also our sage advisor on the ceramics of the area, and in future years will undoubtedly be the one to analyze the pottery recovered from the excavations and from the survey. He has immediate direction of the archaeologists, although he and I occasionally excavate in sites. Peterson's other duties are administrative; he actually keeps the accounts, does most of the local buying, and sees to the running of our field headquarters. Peterson's wife, Angelita, runs the household with the help of various servants she has hired. I feel guilty about this. She supplies us with excellent food, runs the household and servants most efficiently, and is unpaid.

The main dig at Coxcatlan was under the direction of Dr. Melvin L. Fowler, archaeologist of the Museum of Southern Illinois University who has had considerable experience in digging caves and rock shelters in the eastern United States. Not only has he used excellent techniques in the digging of Coxcatlan, but his excavating crew of 15 men is an extremely well-trained one, and his advice on other excavations and analysis has been invaluable.

The other archaeologist was Angel Garcia Cook, a graduate student in the Department of Anthropology of the National University of Mexico. He came to our excavation with little or no field experience although he had a fine academic record. Sr. Jose Luis Lorenzo, Director of the Department of Prehistory of the Instituto Nacional de Antropologia e Historia was instrumental in obtaining his services for us. During the months of training he developed into an excellent field worker; he was in charge of excavations in El Riego Cave.

There were, of course, archaeological workers who numbered about 30 during our maximum activity. Some of these local workmen, who became excellent field technicians, will be the basis for larger crews in our coming extensive season. In this coming season of excavation, we hope to obtain two more trained archaeologists to supervise the digging of other caves.

Dr. C. Earle Smith, Curator of Vascular Plants at the Chicago Natural History Museum, was on loan to us during the summer months and in the first season began to familiarize himself with the botany of our area and to make an intensive survey of the summer flora. His wide experience working with archaeologists in Bat Cave was educational for us. Also, he was able to advise and help interpret the studies of various technical consultants. In future years he will be analyzing, identifying, and interpreting the archaeological plant remains we find in the caves.

The final section of the field project is the archaeological laboratory. Here we were most fortunate in securing as our laboratory supervisor, through the kind offices of Sr. Jose Luis Lorenzo, Miss Toni Nelken, a student of the Sorbonne, who at present is on a fellowship at Escuela de Antropologia writing her thesis on preceramic remains in Mexico. Initially, her duties were the cataloguing and numbering of the vast amounts

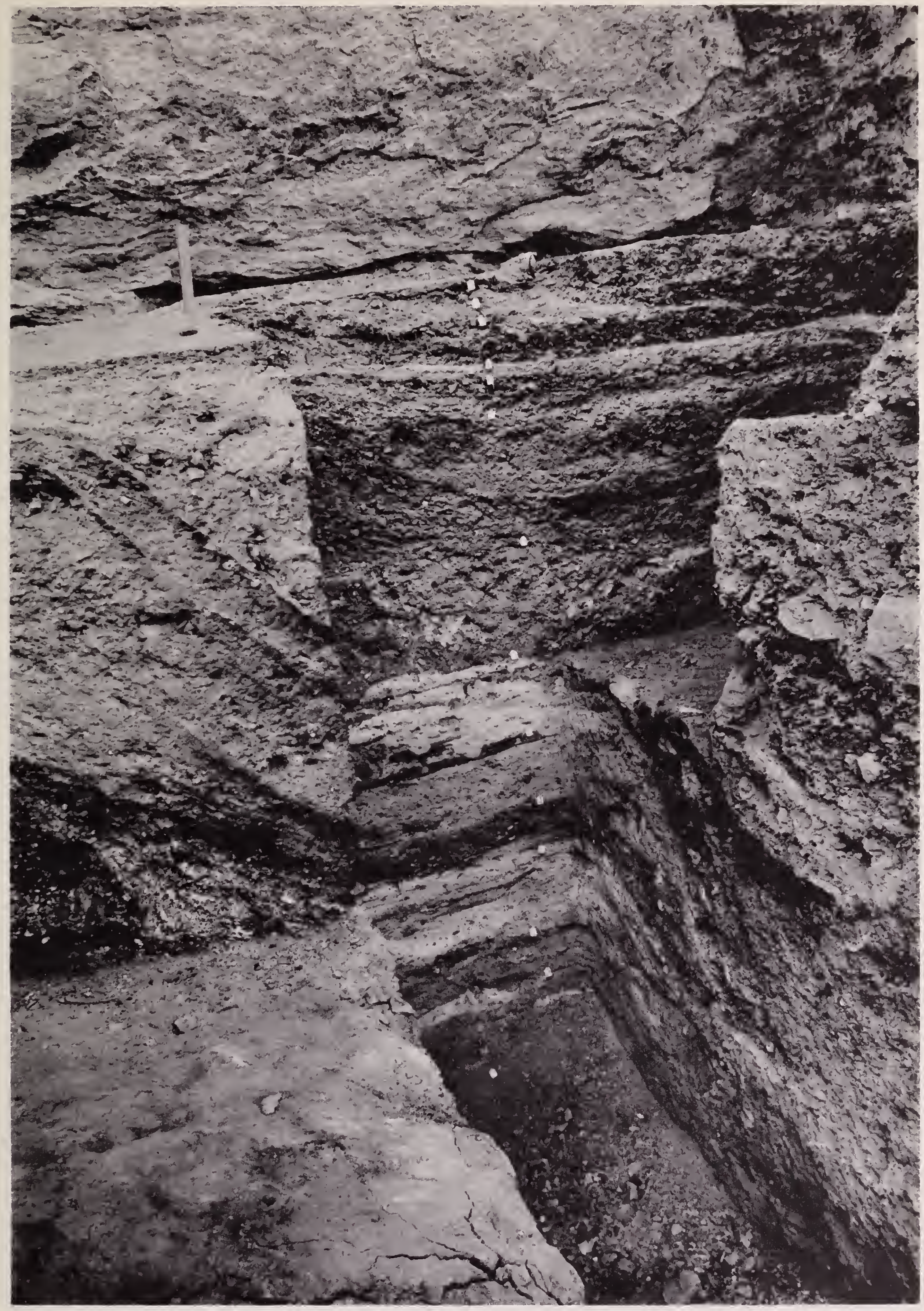


Fig. 3. Coxcatlan Cave. Stratigraphy at east end.

of archaeological materials recovered from excavation and survey. Furthermore, in conjunction with cataloguing, she has typed the field notes and correlated them with the various profile drawings and labels of the specimen bags. In fact, many of her first season's duties were those of a secretary - a most unusual secretary since she knows archaeological jargon, and takes dictation in English as well as in Hungarian, French, and Spanish. I am not particularly proficient in any of the last three. During the last weeks of May, she and I began a preliminary analysis of the artifacts from the two cave excavations. In future seasons her major duty will be assisting with the analysis of artifacts, as well as arranging specific kinds of materials for consulting specialists.

The third division of our task falls on technical consultants. Present day archaeology, like most scientific fields, has advanced to the point where no individual is capable of analyzing expertly all excavated material from all standpoints; thus archaeologists must seek help from a large group of scientists in a number of different fields. This is particularly true of the Tehuacan project which has one foot planted in the field of archaeology and the other firmly in botany. Of course, the majority of this technical analysis will be done in the later seasons after more materials have been uncovered, but some has already occurred.

The first preliminary analysis was done by Dr. Paul C. Mangelsdorf, Director of the Botanical Museum of Harvard University and his assistant W. C. Galinat, after the initial testing of Coxcatlan Cave in the winter of 1960. They determined that the earliest cobs then found were "wild corn and/or wild corn in the first stage of domestication" and that the Tehuacan area was worth intensive investigation. During the summer of 1961 they studied more cobs from the three earliest zones found in Coxcatlan Cave. Also, carbon was sent to Dr. James B. Griffin, Director of the Museum of Anthropology at the University of Michigan for age determination by H. R. Crane in the University of Michigan Radiocarbon Laboratory. The carbon-14 date of 3600 B.C.± 250 for the second stratum of Tc50, containing corn cobs, indicated that the Tehuacan region contained the oldest known corn in the world. More samples of carbon from more layers have now been collected and are being readied for analysis. Obsidian chips were analyzed for age determination by Donovan Clarke of the Obsidian Dating Project, United States National Museum in the winter of 1960. They somewhat confirm the stratigraphy and carbon-14 dates and a much larger sample of chips was sent to him in the summer of 1961.

The cucurbit remains from the 1960 Coxcatlan test were sent for analysis to Dr. Thomas W. Whitaker, Director of the United States Horticultural Field Section at La Jolla, California and Dr. Hugh C. Cutler, Director of the St. Louis Botanical Gardens. The results of the preliminary studies of these remains from Puebla, when compared with previous studies of similar stems, rinds, and seeds from Tamaulipas, have important implications relative to the theory of multiple origins of New World agriculture. The identification of seeds of fully domesticated pumpkins in Puebla no earlier than 3000 B.C. and the knowledge that pumpkins of Tamaulipas were first domesticated between 6000 and 7000 B.C. would seem to indicate that the origin of pumpkins was in northern Mexico and that the plant spread slowly to the south. This contrasts with squash which is shown by studies to have occurred perhaps as early as 6000 B.C. in Puebla but not until 2000 B.C. in Tamaulipas; it therefore appears that its origin was in the south and that it spread slowly into northern Mexico. Furthermore, gourds date from at least 6000 B.C. in Tamaulipas and from about 4000 B.C. in Puebla; walnut squash dates from 1000 A.D. in Puebla and 500 A.D. in Tamaulipas. These dates are not consistent with the idea that all cucurbits were domesticated in a single locale. These tentative conclusions about origin and spread of cucurbits will be checked by further data from Puebla. Materials from the 1961 excavation are being set aside in the laboratory for future analysis.

Five suites comprising 128 samples were collected from the excavation for pollen analysis by Monica Bopp, of the Rockefeller Foundation. This study should give information about changes in vegetation, and therefore climate, during man's occupancy as well as the existence of corn or related grasses in the Tehuacan Valley

Irmgard W. Johnson, associate of the Museo Nacional de Antropologia e Historia, of Mexico visited the laboratory in Tehuacan and began a preliminary study of the 34 textile fragments unearthed in the caves. At present, she is preparing a report. One fragment, about 1,000 years old, was of particular interest because it was a piece of woven cotton gauze in which a design has been crochetted. This type of cloth has not previously been found in Mexico although similar cloth is known from South and Central America.

We have received numerous visits from technical consultants most of whom will be initiating more extensive studies in the future. Of particular help has been Sr. Jose Luis Lorenzo who knows the geology of the Tehuacan area extremely well. Drs. Wellhausen, Barnes, Johnson and Allen, of the Rockefeller Foundation have visited the laboratory to inspect our corn samples. All these gentlemen have added important information to our knowledge of corn and have indicated profitable avenues of inquiry.

A number of other professional visitors have offered advice although they are doing no specific analysis of any of the expedition's findings. Early in the season, Dr. Eusebio Davalos, Director of the Instituto Nacional de Antropologia e Historia and Joaquina Cortina discussed excavation methods with us while visiting the Coxcatlan dig. Dr. Pablo Martinez del Rio has discussed our findings with us, inspected some of the artifacts and offered sound advice, concerning the position of our preceramic remains in the larger picture of ancient Mesoamerican history. Prof. Juan Armenta, archaeologist of the State of Puebla spent a few days at our excavation and worked with us in the laboratory. Sra. Carmen Cook, Director of the Centro de Investigaciones Antropologicas de Mexico had discussed ethnographic problems of the Tehuacan area with

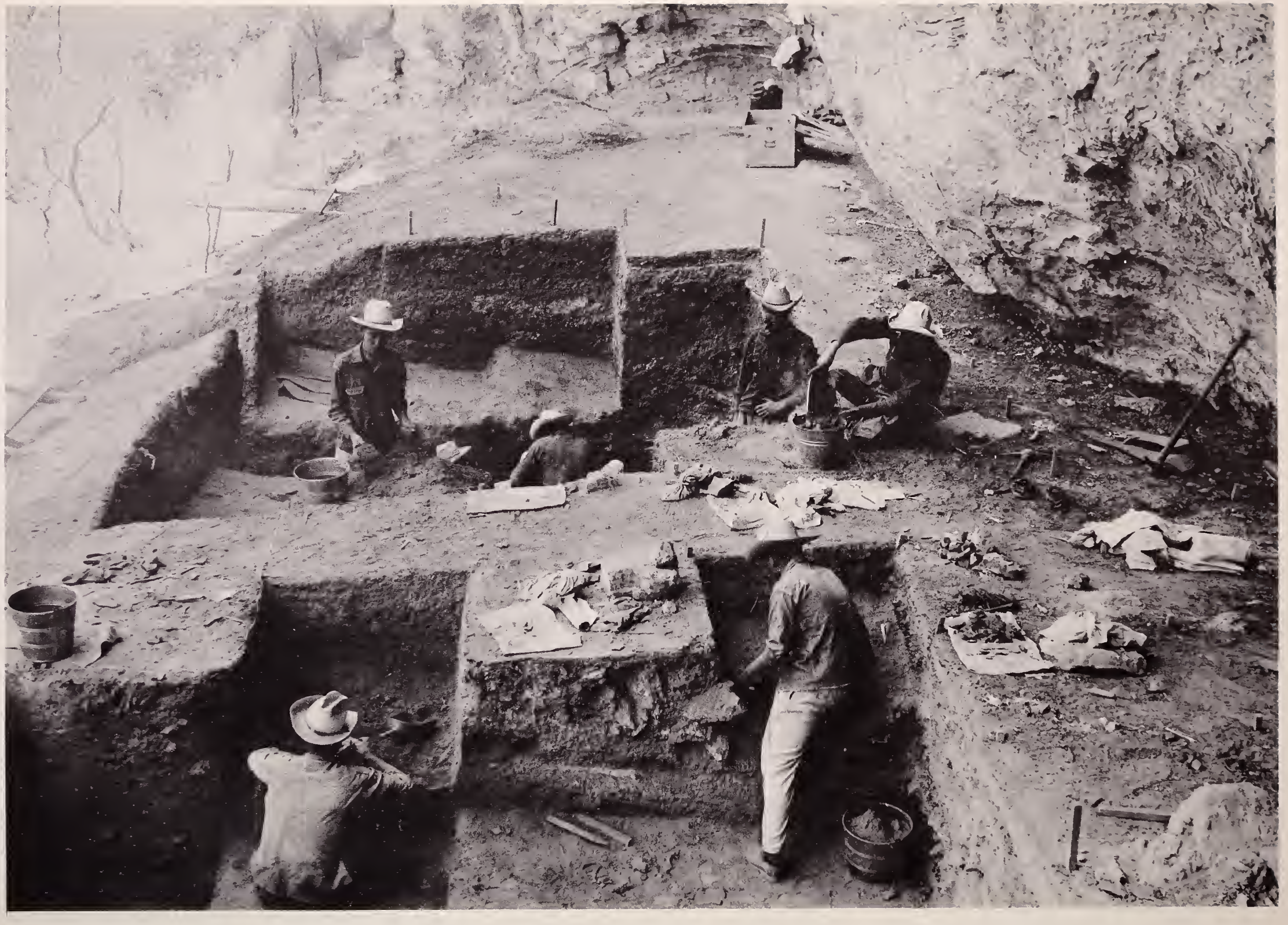


Fig. 4. Coxcatlan Cave. Excavation by "step technique" in progress.

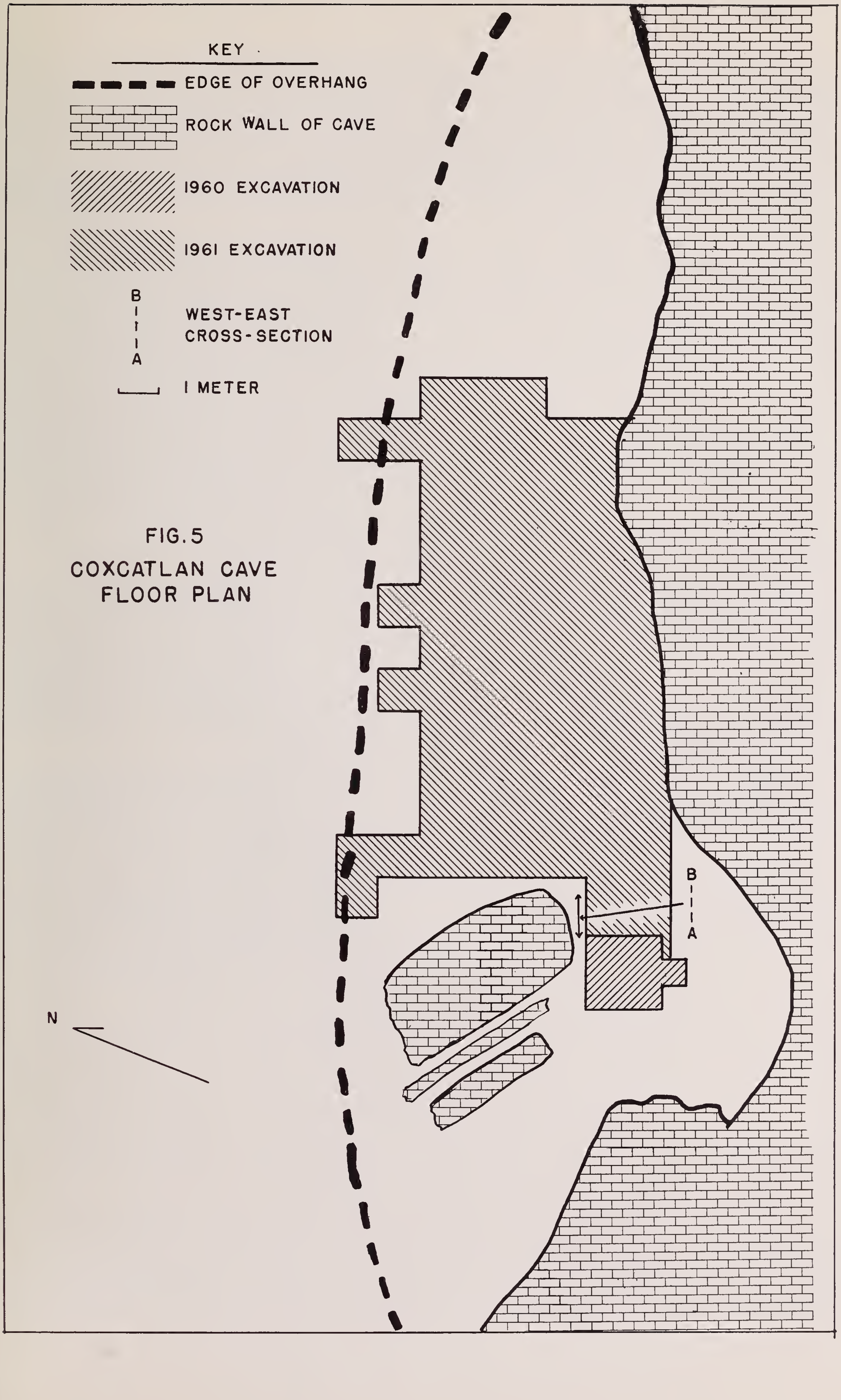


FIG. 5
COXCATLAN CAVE
FLOOR PLAN

us and has studied the fine orange pottery which we have uncovered. We also had a visit from members of a conference of the American Dental Association which met at the Hotel Penafiel. These gentlemen, although interested in the excavation and general work of the expedition, studied rather carefully some of the dental aspects of the skeletons we have uncovered. A number expressed interest in studying our skeletal remains more extensively.

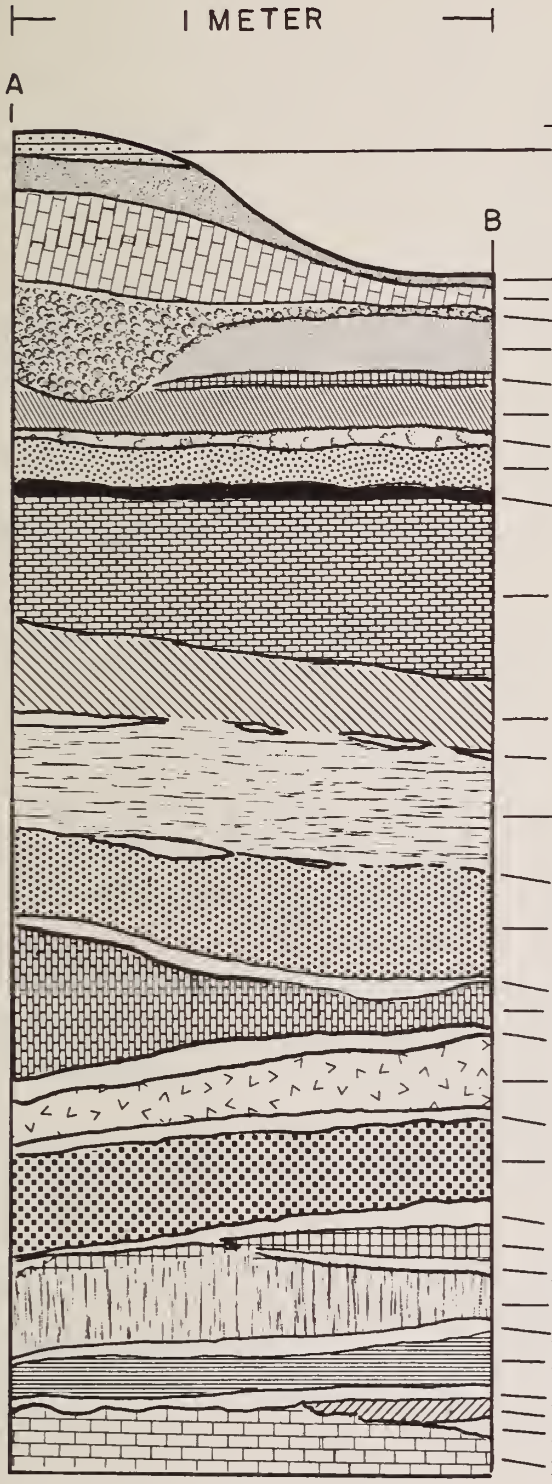
Perhaps of as great assistance as the technical consultants have been various people in Mexico on both an official and unofficial level. In a word, I would like to say that the co-operation received from people in Mexico has been excellent. Early in the expedition's endeavors we received an official permit to work in the Tehuacan area for a three-year period. For this we would like to express our gratitude to Dr. Jaime Torres Bodet, Minister of the Department of Education, to Dr. Eusebio Davalos, Director of the Instituto Nacional de Antropologia e Historia, to Dr. Ignacio Bernal and to Dr. Pablo Martinez del Rio of the Universidad Nacional de Mexico. They give us permission promptly and graciously and also gave us official letters explaining the nature of our work and requesting co-operation by local officials.

Sr. Jose Luis Lorenzo very kindly gave us letters of introduction to various people in the Tehuacan area. Of even greater importance than this were his many visits to our expedition, when he offered sage advice and when he brought students with him from the national university. Furthermore, through his good offices we acquired the use of a vehicle as well as various kinds of camping and digging equipment. We also express appreciation to him for many other favors.

Prof. Juan Armenta worked with us and negotiated the loan of a commando truck. Through him we received letters of introduction and instruction from the Governor of the State of Puebla, Fausto M. Ortega, the Military Commander of the zone, General Ramon Rodriguez Familiar.

We were also greatly assisted by numberous people in Tehuacan, to name a few, Dr. Juan Fernandez, President of the Municipio of Tehuacan; Sr. Miguel Angel Herrero, President of the Chamber of Commerce, Sr. Ricardo Gutierrez, Assistant Manager of the Hotel Penafiel; Sr. Jaime Zurita, President of the Commercial Bank of Tehuacan; and Sr. Isaac Paredes Roman, Director of the tourist bureau in Tehuacan. I also would like to express my thanks to the people of the town of Coxcatlan, including the Mayor, Sr. Joaquin Bolanos, Srta. Berta Martinez, and the Sergeant of the local garrison and his military group which guarded our archaeological excavation. To Colonel Rosendo de Anda we express our thanks for his willing permission to enter onto his "El Riego" Ranch and work there. Because he allowed us to work there, we were able to secure vital parts of our stratigraphic column from El Riego Cave.

Before reporting on the excavations and the finds themselves, it is necessary to mention an important factor in securing our equipment. Early in the season, Peterson and I went to Mexico City and bought the necessary camping and digging materials. This consisted of shovels,



LAYER CONTENT	ZONES	CULTURAL COMPLEX	EXAMPLES OF REMAINS UNCOVERED
Goat dung	Zone A	MODERN	Nails, bullets, glass, glazed pottery, coins
Vegetal layer	Zone B	VENTA SALADA	Stamped, polychrome and black ware pottery, prismatic blades, arrowpoints, cotton cloth, bark cloth, maguey string, sandles, corn, squash, chile, beans, pumpkin, gourds, zapote, chocolate, amaranth, nuts and wild food stuffs
Rock fill	Zone C		
Vegetal layer	Zone D		
Rock fill	Zone E	PALO BLANCO	Monte Alban gray wares, notched and stemmed atlatl points, cotton cloth, sandles, corn, beans, squash, pumpkin, gourds, chile, amaranth and wild plants
Vegetal layer	Zone F		
Rock fill	Zone G		
Vegetal layer	Zone G1		
Rock fill	Zone G2		
Vegetal layer	Zone G3		
Rock fill with refuse	Zone H	AJALPAN	Tres Zapotes black wares, stemmed points, cotton cloth, corn, pumpkins, beans, amaranth, squash, gourds, chile, zapote and wild food stuffs
Dark refuse	Zone I	COXCATLAN	Gary, Coxcatlan, Abasolo, Flaco, and side-notched points, small disk choppers and scrapers, blades, conical polyhedral cores, knotted nets, split-stitch bundle foundation baskets, thin stone bowls, pebble manos, boulder metates, mullers, subsistence based on wild plants but early is squash and corn then gourds and then beans, pumpkins, chile and amaranth
Ash layer	Zone J		
Dark refuse			
Ash layer	Zone K		
Dark refuse			
Ash layer			
Rock fill	Zone L	EL RIEGO	Gary, Almagre, Kent, Tortugas, Agate Basin, Abasolo, Kinney and Plainview points, flat scraper planes, domed scraper planes, pebble scraper planes and skin smoothers, blades, disk and irregular bifacial choppers, bell-shaped pestle, thick stone bowls and mortars, knotted net, non-interlocking stitch bundle foundation baskets, pebble hammers, subsistence almost entirely on wild plants but a few squash seeds appeared in Zones M and N
Ash layer	Zone M		
Burned earth			
Ash layer	Zone N		
Brown refuse			
Ash layer	Zone O		
Dark refuse			
Ash layer	Zone P		
Gray refuse			
Ash layer	Zone Q	AJUEREADO	Lerma and Midland points, snub-nosed end-scrapers, pebble scraping planes, pebble choppers, blades and conical polyhedral cores, flake choppers, hammerstones, subsistence based on hunting and plant collecting
Ashy refuse			
Ash layer	Zone R		
Burned earth			
Ash layer	Zone S		
Rock floor	Zone T		

FIG. 6 COXCATLAN CAVE, WEST-EAST CROSS-SECTION.

trowels, screens, paint brushes, camping chairs, tables, tents, etc. I would like to note here that the Assistant Director, with his long experience in shopping in Mexico was of great aid to the expedition.

Our vehicles consisted at first of one Jeep station wagon which the expedition purchased. At the beginning of the field season the Instituto Nacional was kind enough to lend us one jeep pickup truck and a United States Army Commando truck--nicknamed "The Monster."

Most of the scientists and members of the staff had their own photographic equipment. Notable was the dark-room equipment which belongs to Peterson. Even so, the expedition bought one Rolli-flex camera and film.

Also, the expedition has an extremely large and very useful library supplied mainly by Peterson, but supplemented by some of my own books. Maps, office supplies, desks and various equipment for the laboratory were bought locally.

Although the expedition did not plan to buy furniture, we soon found that a large, unfurnished, nine-room house was very much cheaper to rent than a furnished house. The house consists of five living or bedrooms, one office, one kitchen, two baths, two rooms for laboratory work and storage. A driveway leads into a patio. The house is located at 204 Reforma Street, convenient to local facilities and the center of town. Although the Petersons could supply some furniture, we found it necessary to purchase additional items in order to equip the house. As might be expected, we also had to pay for minor items, such as a telephone, minor carpentry, and the overhaul of the plumbing and electric wiring. The rental of the house amounts to less than $50 a month. An enormous advantage lies in the fact that with our own kitchen and our own cook we can feed our staff meals of the highest quality for about a dollar a day.

We did not expect to do any road building, but we found it necessary to build two roads to reach our cave excavations. In terms of time saved for both supervisors and labor, we found that these two roads represented an actual saving in money.

The first field season began January 6, 1961 and will continue until October. It was divided into two major parts. From January 6 to June 1, the expedition conducted a survey, made two major excavations and two minor ones and initiated a program for laboratory work and cataloguing specimens. From June 1 to October, the survey continued, as did the laboratory work, and the first botanical survey was undertaken.

The archaeological survey and data from maps of rainfall and climate resulted in the definition of the region of exploration as the Tehuacan Valley. This is a long valley extending from Cuicatlan, Oaxaca, at the southern end, to Tepanco, Puebla, at the north. Its northeastern edge is the flank of the Sierra Madre Oriental, or Sierra de Zongolica. Its southwestern border comprises part of the Sierra de Zapotitlan extending from Chazumba to Los Reyes, Puebla, to Tepelmeme to Cuicatlan, Oaxaca (see Fig. 1). The Valley is drained by the Rio Salado and Rio Grande.

Youthful rivers have cut many step canyons in its flanks (see Fig. 2). Annual rainfall within this valley and the regions immediately to the west varies between 400 and 800 mm. Rainfall on the mountains bordering its east edge varies from about 600 mm. per year on the foothills to more than 2500 mm. per year toward the summit. The vegetation reflects the difference in rainfall. The bottom of the valley has spiny scrub and cactus cover. The slopes of the mountains to the east are covered with pine forests and, at the top of the Sierra de Zongolica there are montane rain forests. The temperature of the valley is almost ideal, with cool or cold nights and clear, hot days. Frosts are unknown although temperatures on winter nights may go down to the mid 40's F. Summer nights are cool with temperatures usually below 70° F. Days are hot with temperatures ranging from 60° to 100° F., but even the hottest days are comfortable because of the low humidity.

The results of the survey otherwise were most gratifying, as 203 sites were discovered up to June 30. The basic purposes of the survey were two-fold. First, to find more sites at which excavation might supply links to complete our stratigraphic column or give a fuller picture of a certain part of the sequence. The other purpose of the survey was an adequate sampling of settlements that existed in this circumscribed area in order to determine changes in settlement patterns and population. So far, results have been most encouraging. At least five more rock shelters were discovered. They probably contain long archaeological sequences as well as some preserved foodstuffs. Excavations in them should place the results of this year's excavations on a much firmer foundation. In addition, we now know of six preceramic sites that seem to have been seasonally occupied by bands of people. One large late preceramic site will have to be tested in the future. As yet, no Early Formative (2000-1500 B.C.) or early ceramic sites are known but we do know of one or perhaps two that are of Middle Formative times (1500-600 B.C.); these have irregularly spaced ceremonial mounds. Also, we have found that the frequency of preceramic occupations in rock shelters is disproportionately high in comparison with that of preceramic open sites. Five sites of the Late Formative period (600-200 B.C.) are known, all of which are associated with plazas surrounded by ceremonial structures. Most of our open sites belong to the Classic period (200 B.C.-800 A.D.). They are predominately on the tops of hills or mountains in relatively defensible spots; they contain a large number of ceremonial structures. In the valleys below these ruins are remains of irrigation works. From a hurried counting of house structures and platforms, we have ascertained that these sites range from modest villages to ceremonial cities. Post-Classic period sites (800-1500 A.D.) make up our second largest group. They are in the bottoms of the valleys. These range from small hamlets to a number of large cities. There is considerable evidence of economic specialization in these sites. It would seem that the cities had both a religious and a commerical base. Irrigation features are less numerous than they are at Classic sites, but this condition may be more apparent

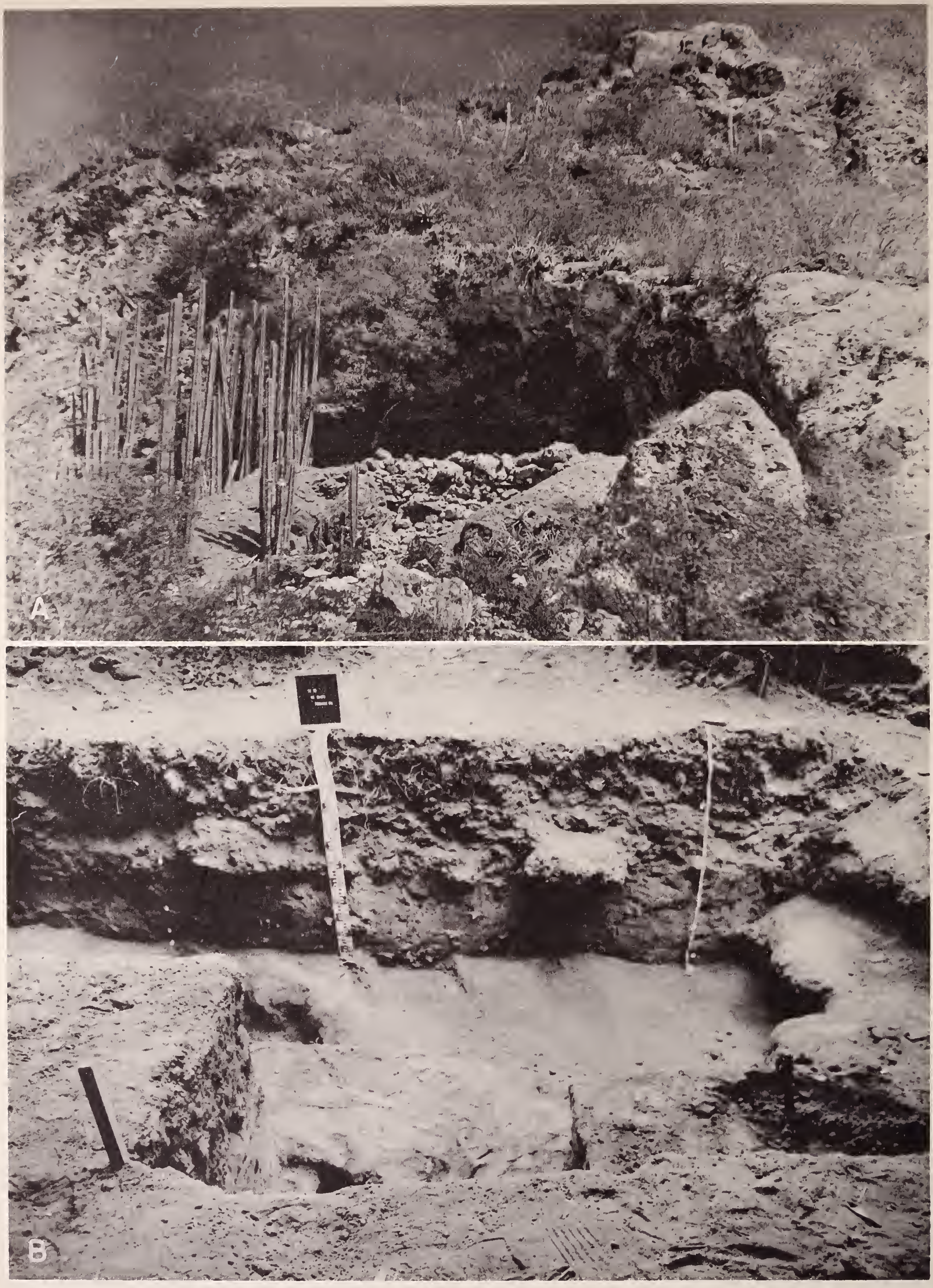


Fig. 7. El Riego Cave. A, View of the entrance from the south; B. Profile at west end showing various strata.

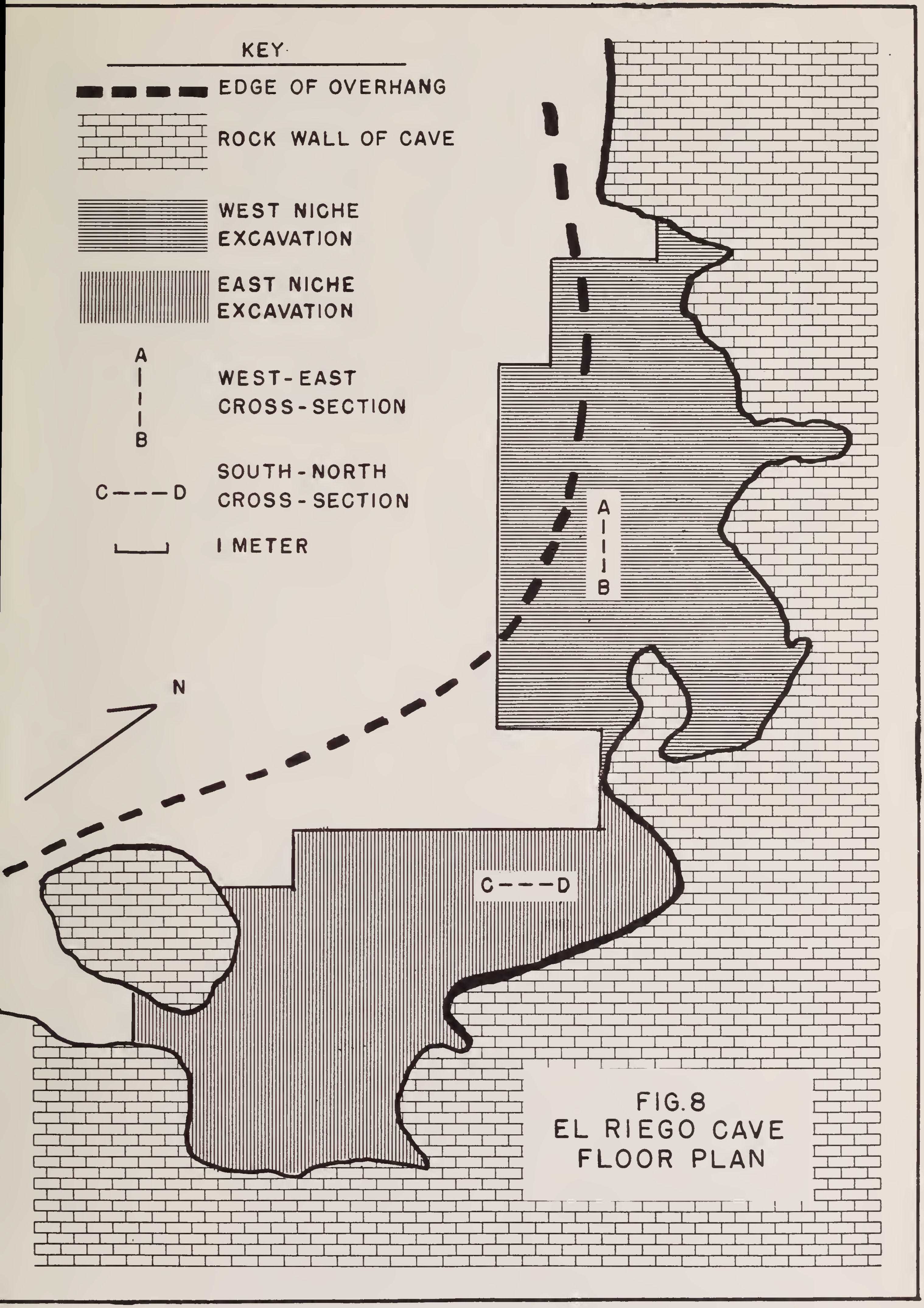
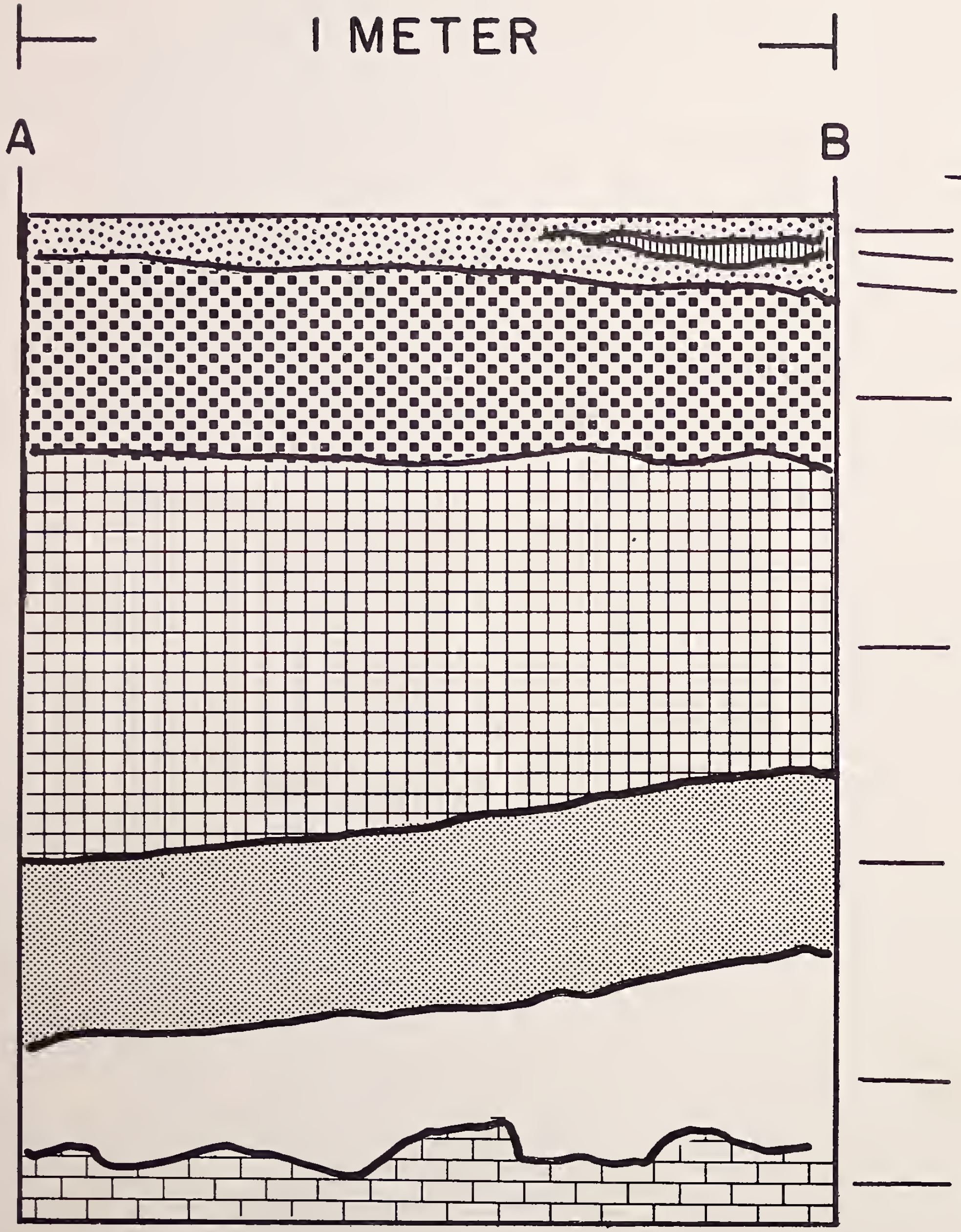
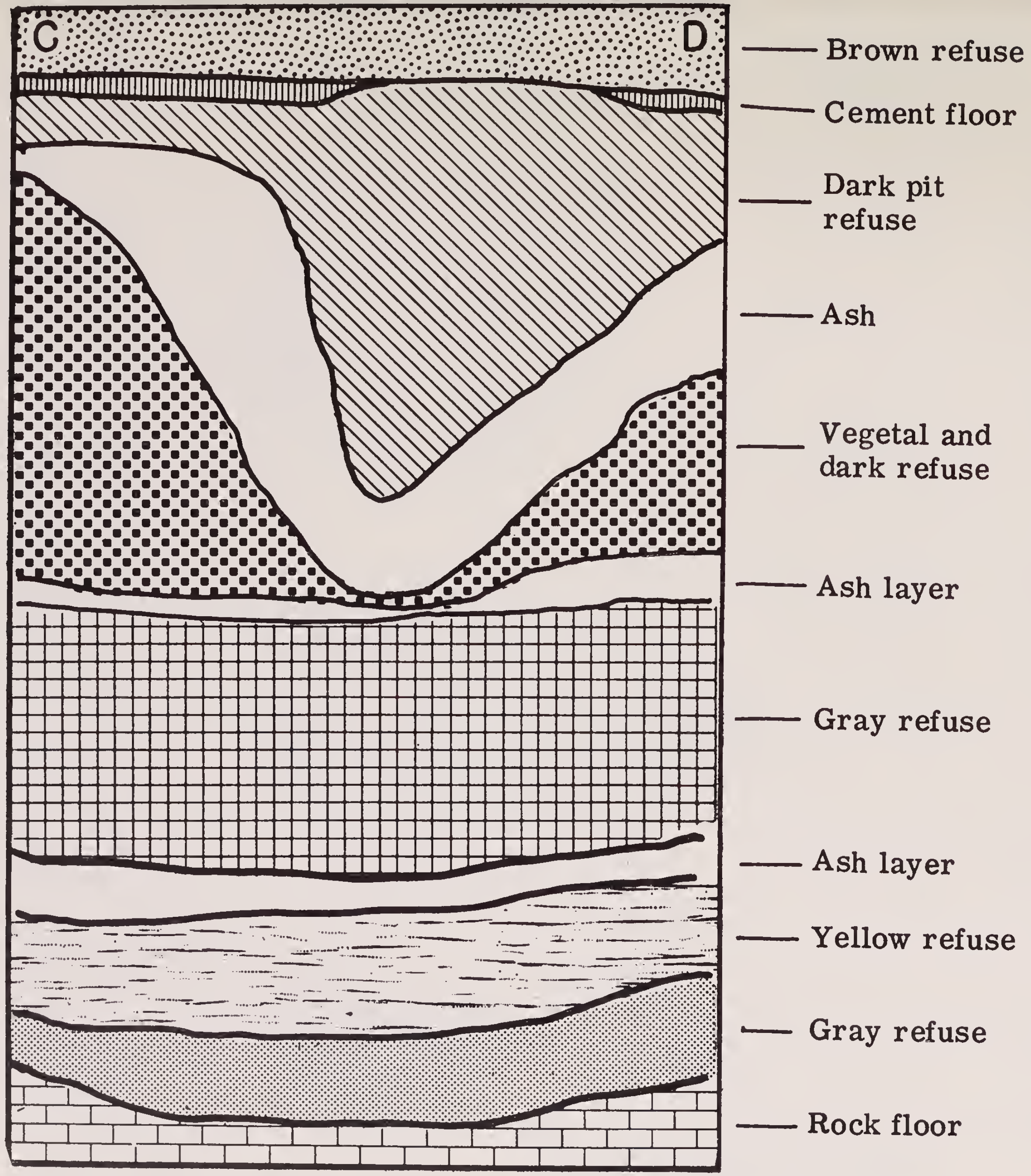


FIG. 8
EL RIEGO CAVE
FLOOR PLAN



LAYER CONTENT	CULTURAL COMPLEX	EXAMPLES OF REMAINS UNCOVERED
Brown refuse Cement floor Brown refuse	VENTA SALADA	Polychrome and stamped pottery, arrowpoints, blades, burials and side scrapers
Black layer	PALO BLANCO	Monte Alban gray ware pottery, notched and stemmed points, blades, manos, metates, tripod stone mortars and disk scrapers
Gray refuse	ST. MARIA AND AJALPAN	Tres Zapotes Black ware pottery, modeled clay figurines, Gary, notched and stemmed points, manos, metates, blades, snub-nosed end scrapers and tripod stone mortars or bowls
Gray ash	COXCATLAN	Coxcatlan, Gary and Morhiss points, thin stone bowls, pebble manos, blades, disk choppers and scrapers and chipped drills
Yellow ash	EL RIEGO	Plainview, Agate Basin, Kent, Gary and Tortugas points, Domed scraping planes, stone mortars and pestles
Rock floor		

FIG. 9 EL RIEGO CAVE - WEST NICHE, WEST-EAST CROSS-SECTION.



VENTA SALADA	Polychrome and stamped pottery, jars with food offerings, woven gauze, cotton cloth, bark cloth, arrowpoints, wooden weaving tools, bark beater, corn, beans of a number of kinds, pumpkins, squash, gourd, chile, and zapote
PALO BLANCO	Monte Alban gray ware pottery, notched and stemmed points, bark cloth, cotton cloth, coiled basketry, corn, squash, beans, pumpkin, gourd, chile, wooden weaving tools, nets, mold-made clay figurines, incense burners and stone earplugs
ST. MARIA	Black ware and white rimmed black ware pottery, Ticoman clay figurine, stemmed points, corn, squash, beans, pumpkins, cotton, amaranth, chile, zapote, metates, manos, blades, cylindrical polyhedral cores and small disk end scrapers
AJALPAN	Tres Zapotes black ware pottery, Baby face Olmec figurine, stemmed points, corn, squash, beans, pumpkins, cotton cloth, amaranth and chile
EARLY FORMATIVE ?	CRUDE plain pottery, blades, corn, squash, beans and pumpkins

FIG. 10 EL RIEGO CAVE-EAST NICHE, SOUTH-NORTH CROSS-SECTION.

than real because modern irrigation may cloak prehistoric works.

The expedition conducted two major excavations. The most important of these was in Coxcatlan Cave about 20 miles south of Tehuacan. I discovered this cave in 1960 and in early March, 1961, I started excavation there. In April and May, Melvin L. Fowler took over the direction of the digging.

This rock shelter is long (40 meters), narrow (6 to 15 meters), and relatively high (8 meters) (see Figs. 3 and 5). During the 1961 season we excavated about half of the cave, mainly the center portion, where we put in a trench about 16 meters long by 6 meters wide and 3 meters deep, by the vertical slicing method. We first put in a trench from exterior to the back wall in the east end of the rock shelter as well as one in the west end of the rock shelter. Then, moving forward one meter at a time, we drove the two trenches toward each other until they met in the center. Such a system allowed us to see the various strata in cross section, to draw and photograph profiles one meter apart each way, and to maintain good control of the operation of stripping and excavating each individual layer (see Fig. 4). In total there were 20 major sequential layers, called zones A to T; three of these zones were composed of a number of sub-divisions so that actually there were 26 strata and sub-strata, in our vertical cut. Nineteen strata were the remains of ancient floors (see Fig. 4 and Fig. 6).

The ancient floors contained tools; these we have grouped into six archaeological complexes. Not only were there stone and bone tools in each of these strata but the upper ones contained string, textiles, basketry, mats, and wooden tools as well as quantities of ancient foodstuffs. The six sequential archaeological complexes are called beginning from the bottom, Ajuereado, El Riego, Coxcatlan, Ajalpan, Palo Blanco and Venta Salada.

The second major excavation, in El Riego Cave about 2 miles north of Tehuacan, was begun early in the month of May (see Fig. 7). I started digging but by the end of the first week, I placed the excavation under the direction of Angel Garcia Cook.

This cave is an irregularly-shaped one with two rather large niches in it. Each of the two niches is about 8 meters wide and 4 meters deep; the roof is about 4 meters above the floor. The east niche was excavated first and we endeavored to continue digging from a vertical face which had been previously dug across its mouth. The actual stratigraphy was extremely complex except for a single cement floor in the upper portion of the refuse. In this floor were post holes and a bath-tub-like structure. Ceramics associated with this floor and structure show that it was Post-Classic in time. Below it were storage pits and pits containing food offerings. Perishable remains and foodstuffs were excellently preserved. The majority of these 38 pits are of the Post-Classic and Classic periods but three were of Late Formative and one, of Middle Formative, contained Olmec figurines. Below this Middle Formative pit was a small layer which contained Early Formative pottery.

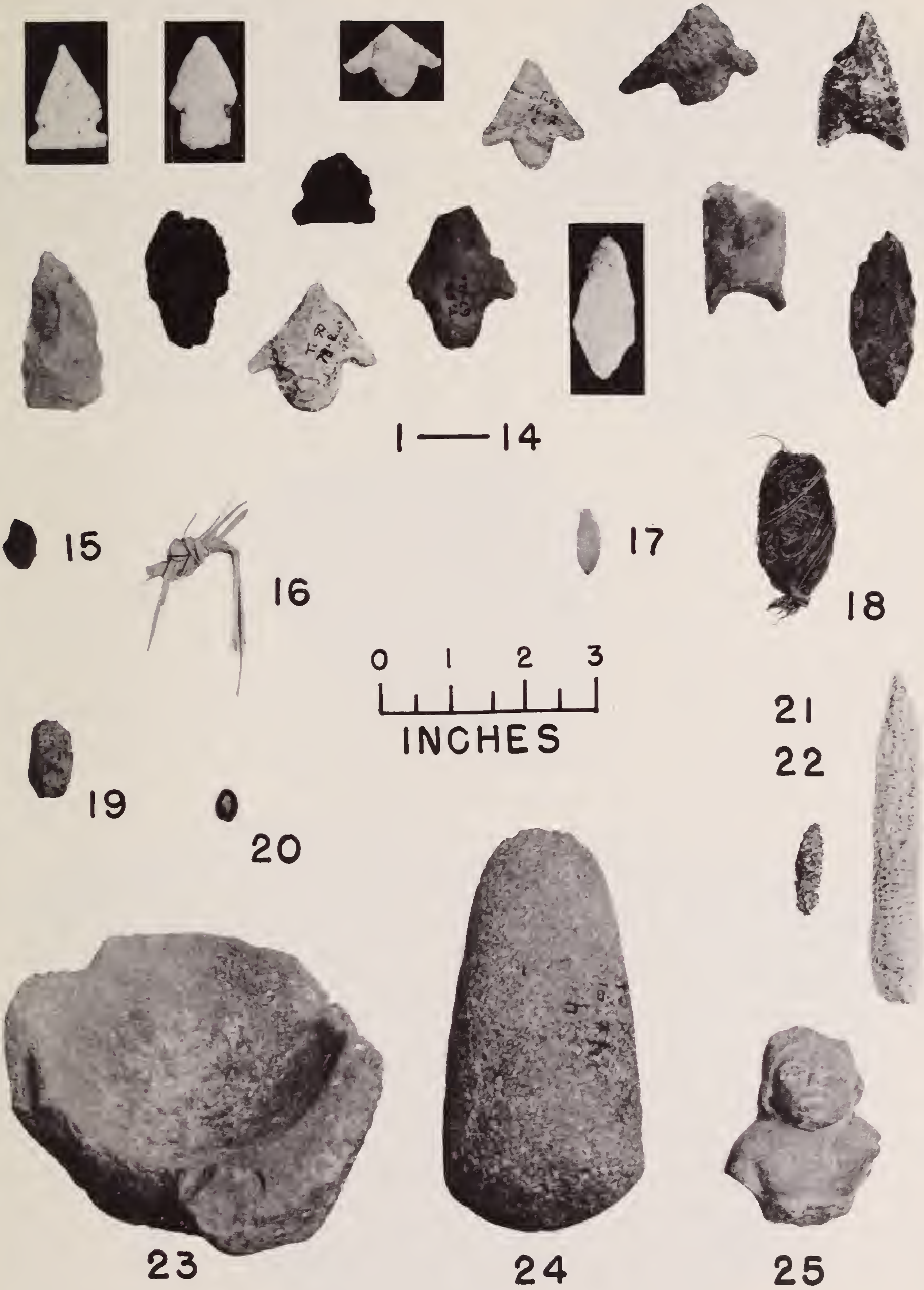


Fig. 11. Projectile points, vegetal materials and other artifacts: 1-14, projectile points; 15, nut; 16, tied grass strand; 17, squash seed; 18, chewed quid; 19, cactus fruit; 20, bean; 21, 22, corn cobs; 23, stone mortar; 24, pestle; 25, Olmec figurine.

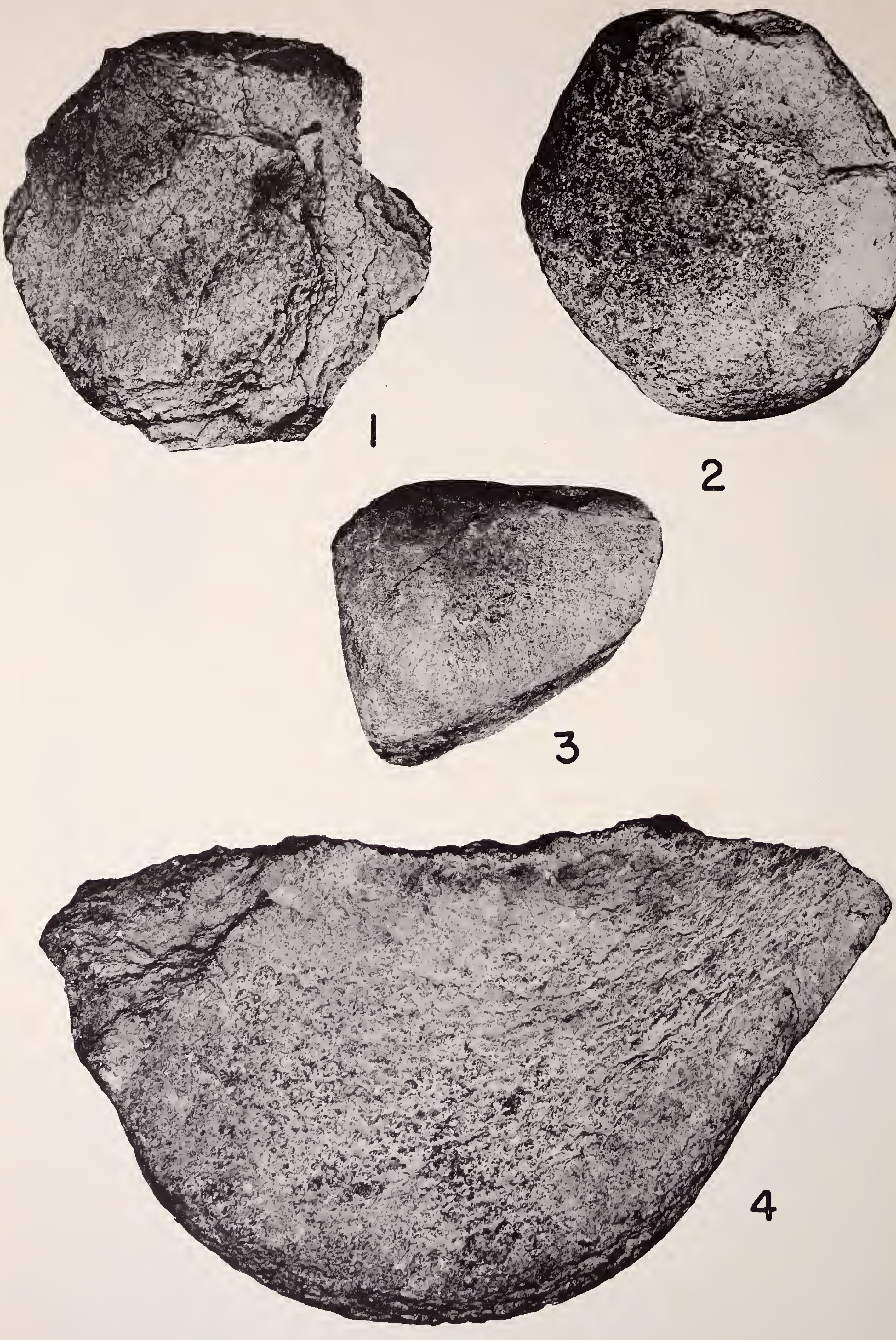


Fig. 12. Heavy stone tools. 1, chopper; 2, hammerstone; 3, pebble mano; 4, boulder metate.

Right on the rock floor of the cave were two preceramic projectile points.

The west end of the cave, stratigraphically, bore little resemblance to the east end. except for the top level. In the west niche, the top layer contained parts of a cement floor and burials and food offerings of the Post-Classic period. Under the cement floor, which connected with the top layer in the east niche, was a dark layer which had no counterpart in the east. It contained Classic sherds. The dark layer faded into a gray zone in which were remains of the Formative period. These more or less confirm the stratigraphy in the east end but below them the picture was completely different. Underneath the gray zone was a white ash layer about one foot thick which contained a great number of preceramic tools that seem to belong to the Coxcatlan complex. This in turn overlay a yellower ash layer, a foot thick, covering the floor of the cave. The yellower layer was extremely rich in preceramic artifacts, most of which belong to the early part of the El Riego complex. The west end of the cave did not contain any preserved food remains.

Our superficial analysis indicates that El Riego Cave has the following sequence of archaeological complexes. The earliest, in zone 5 of the west end, is the El Riego complex which is overlain in zone 3 and 4 by materials very similar to those of the Coxcatlan complex. Next we have sherds of an undefined, perhaps Early Formative, type from the bottom levels of the east end of the cave. These, in turn, are under materials of the Ajalpan complex (Middle Formative) and Sta. Maria complex (Late Formative) in zone 3 of the west end and the lower pits in the east end. Remains of the Palo Blanco complex (Classic Period) occur in the upper pits in the east section as well as in zone 2 of the west end. Post-Classic remains of the Venta Salada complex, are in the top layers. Thus, the stratigraphy of the two caves tend to agree, though Coxcatlan Cave has an early complex called Ajuereado which is older than anything in El Riego. In El Riego Cave there are Early and Late Formative remains above and below the Ajalpan complex (see Figs. 9 and 10). Preliminary analysis indicates the tentative reconstruction shown in Fig. 15.

Our earliest material, which we have named the Ajuereado complex, occurred only in Coxcatlan Cave in zones Q, R and S. Occupations were brief, and two of the three were by very small groups. There is a larger proportion of bone in these levels than in others although I suspect that people were still mainly plant collectors. Lerma points are particularly characteristic although a Midland point occurred (see Fig. 11). Scrapers are mainly end-of-blade or relatively small snub-nosed scrapers. In zone Q, the latest part of this complex, there are a few scraping planes made from pebbles. Flake choppers, blades, and polyhedral cores occur and the side scrapers are, in the main, quite large.

The second complex, called El Riego, occurs in zones M, N, O and P in Coxcatlan Cave as well as the lower zone 5 of El Riego Cave. A number of types of projectile points occur here, including Plainview, Agate Basin, perhaps Kinney, and definitely Kent, Gary, Almagre,

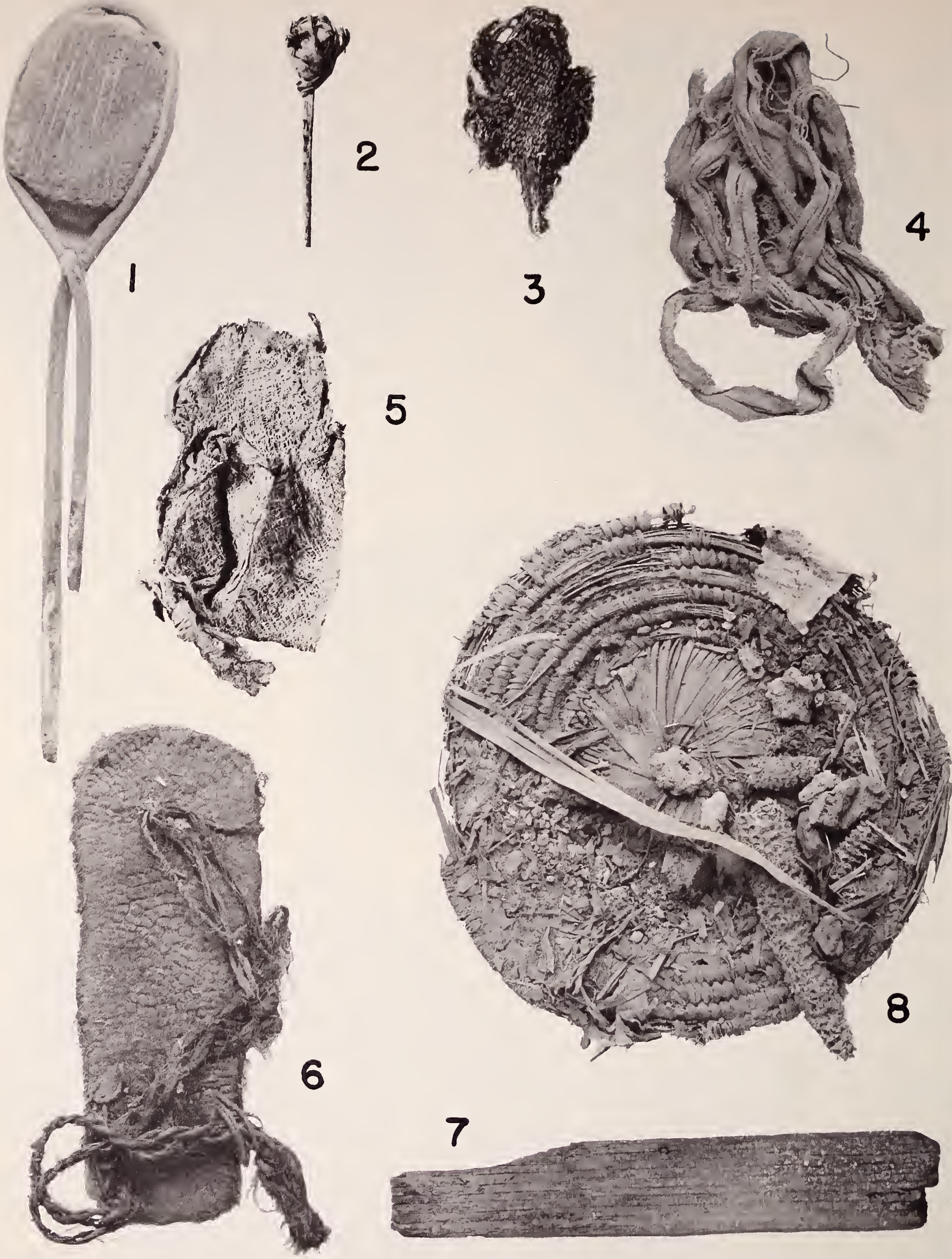


Fig. 13. Basketry, textiles, etc. 1, bark beater; 2, needle with thread wrapped about head; 3, woven cloth; 4, cotton cloth belt; 5, fragment of bark cloth; 6, sandal; 7, wooden heddle for loom; 8, basket with corn inside. Note: scale for 2, 3, and 5 differs from other specimens in this figure.

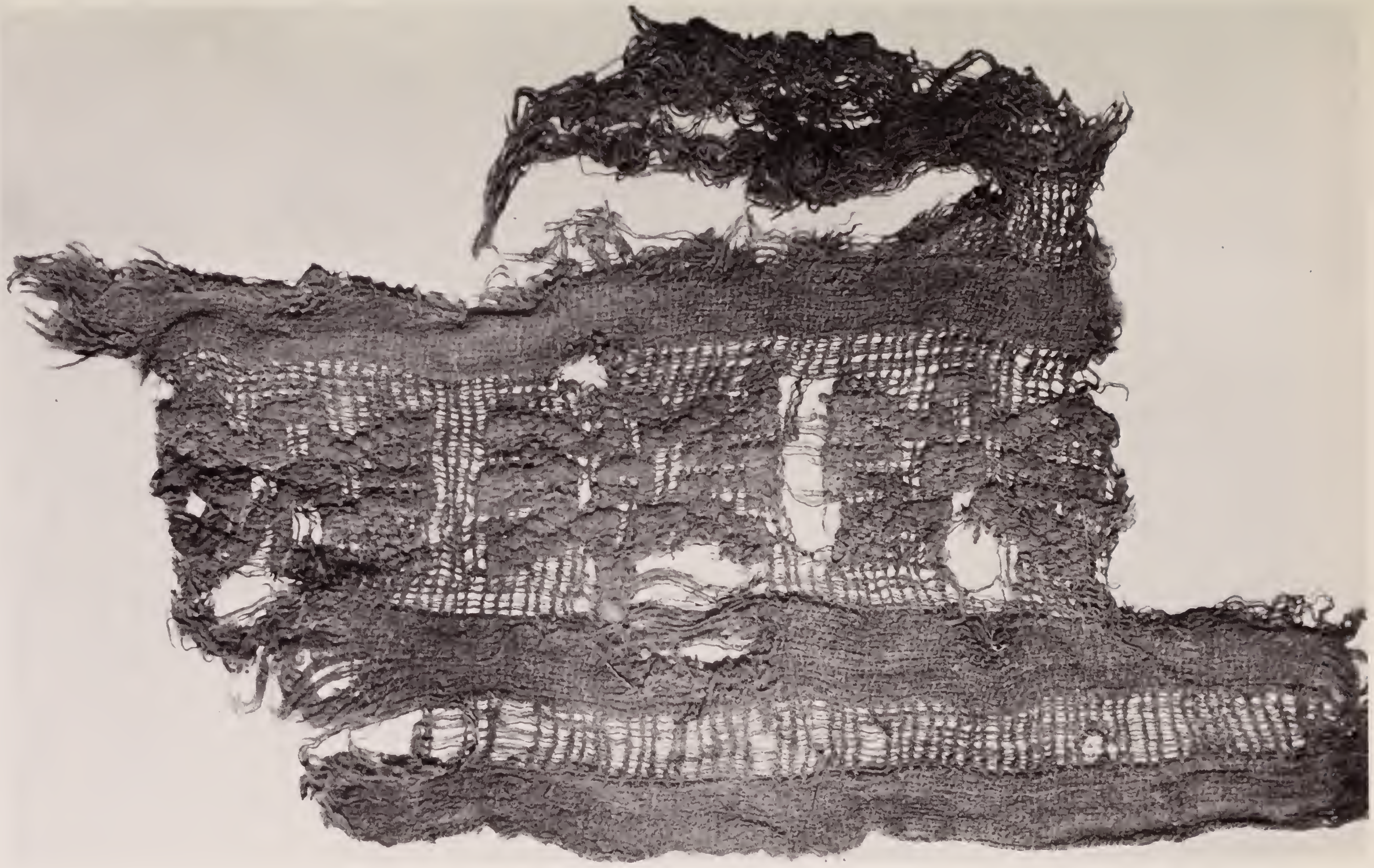


Fig. 14. Cloth with embroidered design.

Abasolo, and Tortugas (see Fig. 11). However, much more significant than the projectile points are about five types of scraping planes, masses of bifacial choppers, battered pebbles, skin smoothers, a flint drill, knotted nets, coiled basketry, blades and side scrapers (see Fig. 12). In this horizon appear for the first time mullers, bell-shaped pestles, and heavy, thick stone bowls or mortars. The small amount of foodstuffs we have indicate that the people were mainly plant collectors although they knew domestic squashes. Occupations of the cave by El Riego people were still of relatively short duration, but some seem to have been made by fairly good-sized groups. We have also recorded about five open sites assignable to this complex; these sites suggest that relatively large groups of people occupied them seasonally.

The Coxcatlan is our best represented preceramic complex. It occurs in zones I, J and K of Coxcatlan Cave and zones 3 to 4 of El Riego Cave. There is considerable evidence of incipient agriculture. The first plants to appear were corn and squash followed by gourds and later beans, pumpkins, peppers, and amaranth. A fairly large number of people seem to have lived in each site for quite a long time. A few types of projectile points carry over from the previous complex but the dominant type is the Coxcatlan point; Flacco and side-notched types and little Gary points also occur. Other remains include gouges, drills, discoidal scraping planes, discoidal choppers, knotted nets, a basket, atlatl foreshaft, blades, and biface knives. Stone bowls continue but differ from those of previous levels. They have a wide variety of forms, and are thinner and better made. I believe most of them are bowls rather than mortars. Manos of at least a couple of varieties occur in great numbers and mullers and boulder metates are fairly common.

Following this complex we may have a short break in the sequence. A few potsherds and a Gary stemmed point from the lowest floor in the east niche of El Riego Cave may belong in this gap.

The overlying materials are better defined and are of Middle Formative time with Olmec figurines, blackware pottery, some nicely woven cotten cloth, and a full assemblage of cultivated plants including some corn that shows the first stage of hybridization. For the moment, this Middle Formative complex is being called Ajalpan. There is one open site with some small mounds, so we judge that Ajalpan people lived in villages which had ceremonial structures.

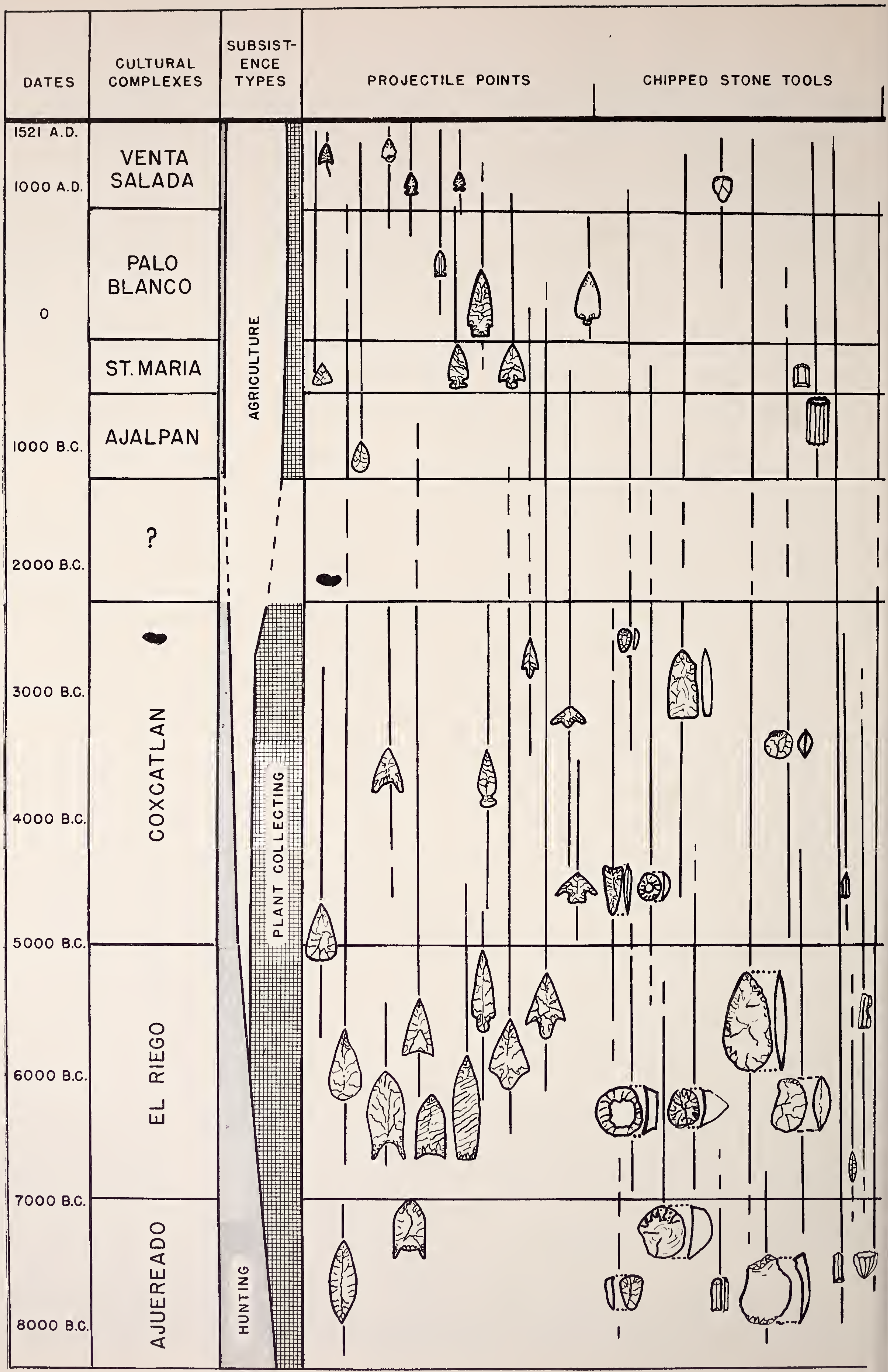
Overlying these materials in El Riego Cave are deposits of Late Formative times with Ticoman type figurines, painted pottery, increased agriculture, more cloth, some mats, some baskets, some Ensor and Palmillas points as well as Gary stemmed points. Agriculture was fully developed; plant remains include large quantities of beans of a number of varieties. We have recorded at least two open sites of the Ajalpan complex with a number of pyramids.

The Classic period is represented by the Palo Blanco complex in level 2 and pits of El Riego Cave, and in zones E, F and G of Coxcatlan Cave. Peterson has recorded at least 60 or 70 sites of this period in the valley, most of them with irrigation features and most of them on hilltops. They range from small villages of 4 or 5 house structures to towns with over 100 house structures covering a whole mountain. There are also a number of sites that are connected with the production of salt. Pottery is like that of Monte Alban III and IV, agriculture is fully developed, coiled baskets occur, as do cloth, wooden bark beaters, a few small side-notched arrowpoints, and the point types of the previous stage. There is a wide variety of artifacts in this horizon; most of them have not yet been analyzed.

Above these remains in both caves, and at about 40 open sites are post-Classic materials of the Venta Salada complex. We now have polychrome pottery, fully developed agriculture with a wide diversity of plants, mold-made figurines, small triangular points, very fancy cloth and woven gauze, bark cloth sandals, at least four varieties of regular woven sandals, and many other things. Our biggest sites, some of which would qualify as cities, occur in the valley bottoms in non-defensible spots; irrigation features connected with these sites are not quite so apparent, perhaps because they have been re-used for modern irrigation. Again, this complex has not been very thoroughly analyzed; the three or four tons of potsherds and other artifacts from this complex which Peterson collected are yet to be washed, numbered, and analyzed. Therefore, the complex is not too well known.

The foregoing concludes in a summary fashion, what we have found and, briefly, how and where it was found. In terms of this data, a review of problems originally defined will indicate what we have accomplished and what remains to be done. First of all, there was the problem of finding the long sequence of cultures from primitive hunters to sophisticated urban dwellers in Mexico. At present, our work in Puebla has revealed the framework of such a sequence. We have cultural remains extending from roughly 11,000 years ago to the time of the Spanish conquest in A.D. 1520. However, our findings are, in reality, only an outline of the total chronology and there is even a possibility of a gap in this sketchy archaeological framework coming approximately between 2000 and 1500 B.C. Obviously, we need more material from every one of our six complexes, particularly at the early levels. These lack adequate samples of artifacts; at the same time, the evidence which concerns subsistence at the early levels is sketchy. Analysis by technical consultants may fill in some of these gaps, but in actual fact we need more material from well-defined strata in other dry cave excavations. The data on settlement patterns throughout this sequence are good in the late periods but almost non-existent in the earlier ones. Thus, it is imperative to search for more open sites with early remains. It may very well be that future reconnaissance should skip later remains and sites in an effort to find habitations of the earlier people.

The foremost specific problem concerns the origin of maize. Presumably, we have the basic data for the solution of this problem but our sample of corn cobs from the earliest level is woefully inadequate and


DATES
CULTURAL COMPLEXES
SUBSISTENCE TYPES
PROJECTILE POINTS
CHIPPED STONE TOOLS
1521 A.D.
1000 A.D.
0
1000 B.C.
2000 B.C.
3000 B.C.
4000 B.C.
5000 B.C.
6000 B.C.
7000 B.C.
8000 B.C.
VENTA SALADA
PALO BLANCO
ST. MARIA
AJALPAN
?
COXCATLAN
EL RIEGO
AJUEREADO
AGRICULTURE
PLANT COLLECTING
HUNTING

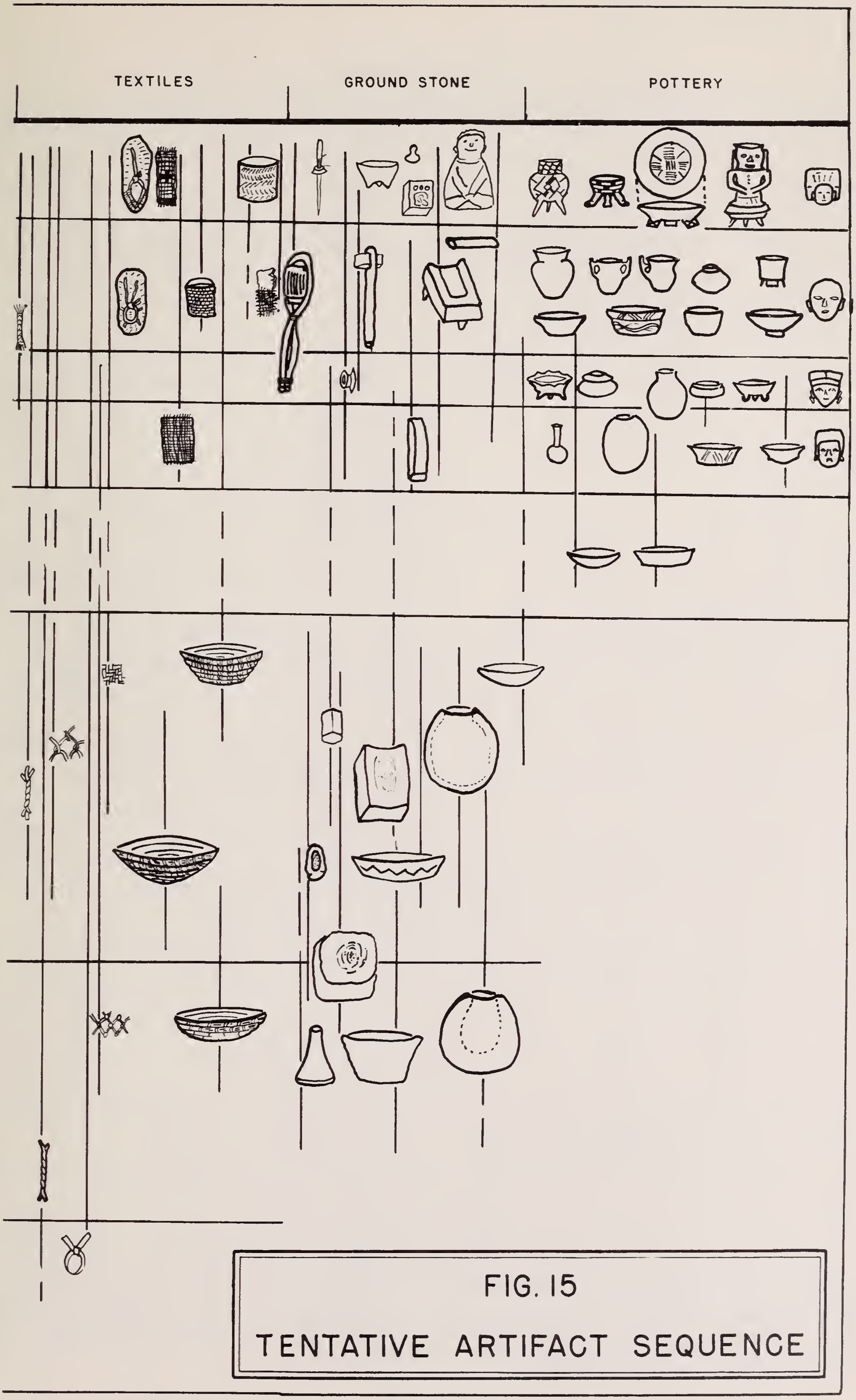


FIG. 15

TENTATIVE ARTIFACT SEQUENCE

we lack any knowledge of totally wild corn existing before 5000 B.C. We need more preserved foodstuffs from the El Riego and Ajuereado complexes. As a by-product to the search for the origin of corn agriculture, we have uncovered some pertinent information bearing on the wider, more general problem of tracing the domestication of plants in the New World. Our present data from Puebla show a sequence beginning with squash as the earliest domesticate, followed in turn by corn, gourds, pumpkins, beans and amaranth, all before 2000 B.C. This sequence is entirely different from the sequence of the order of domestication of plants in Tamaulipas, where gourds and pumpkins were used before beans. Next in order is corn which in turn is followed by squashes and amaranths. Certainly these two sets of evidence indicate the probability of multiple origins of domesticated plants in Mesoamerica. Further work in Puebla should give more evidence to confirm this hypothesis as well as discern the process of cultural change that arose from the origin and spread of these plants.

Our data on the first villages are at the present time practically nonexistent. We have one possible preceramic site that might be a village, but this is only a possibility. Again, more survey is definitely indicated.

The problem of the origin of pottery is far from solved but our recent Puebla data have yielded facts that may have bearing on it. Our new finds in Puebla are the basis for an entirely original hypothesis concerning the origin of pottery in nuclear America. The fact is that in our preceramic sequences we have a shift in the El Riego complex from mortars to stone vessels; in the Coxcatlan complex these stone vessels become better made and confined to three vessel forms identical to the earliest preceramic forms of Mesoamerica. Is it not possible that pottery in Mesoamerica arose from first supplementing stone bowls with clay, then actually duplicating the forms of stone bowls totally in clay? More material from the late preceramic Coxcatlan complex and the earliest ceramic horizon would do much to confirm this hypothesis.

The major problem is, of course, the full reconstruction of the ancient cultures. There has been no ceramic analysis and stone and perishable artifacts have only been cursorily studied. The study of the non-artifactual archaeological material is in even a poorer state. This is, of course, the task of our various technical consultants and for the most part the materials we have found have not even been prepared for cataloguing for these studies. The botanical survey, although off to a good start, is far from complete.

We have made an auspicious beginning in the archaeological field work and appear to have the equipment, personnel and methodology to do even better in the future. In the necessary auxiliary fields we have some materials, have consulting scientists ready and willing to undertake studies, and we believe we have developed techniques for integrating the information. It is very apparent that this season is only the beginning and that the larger and more significant works, studies, analyses, and results still lie ahead of us.

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